AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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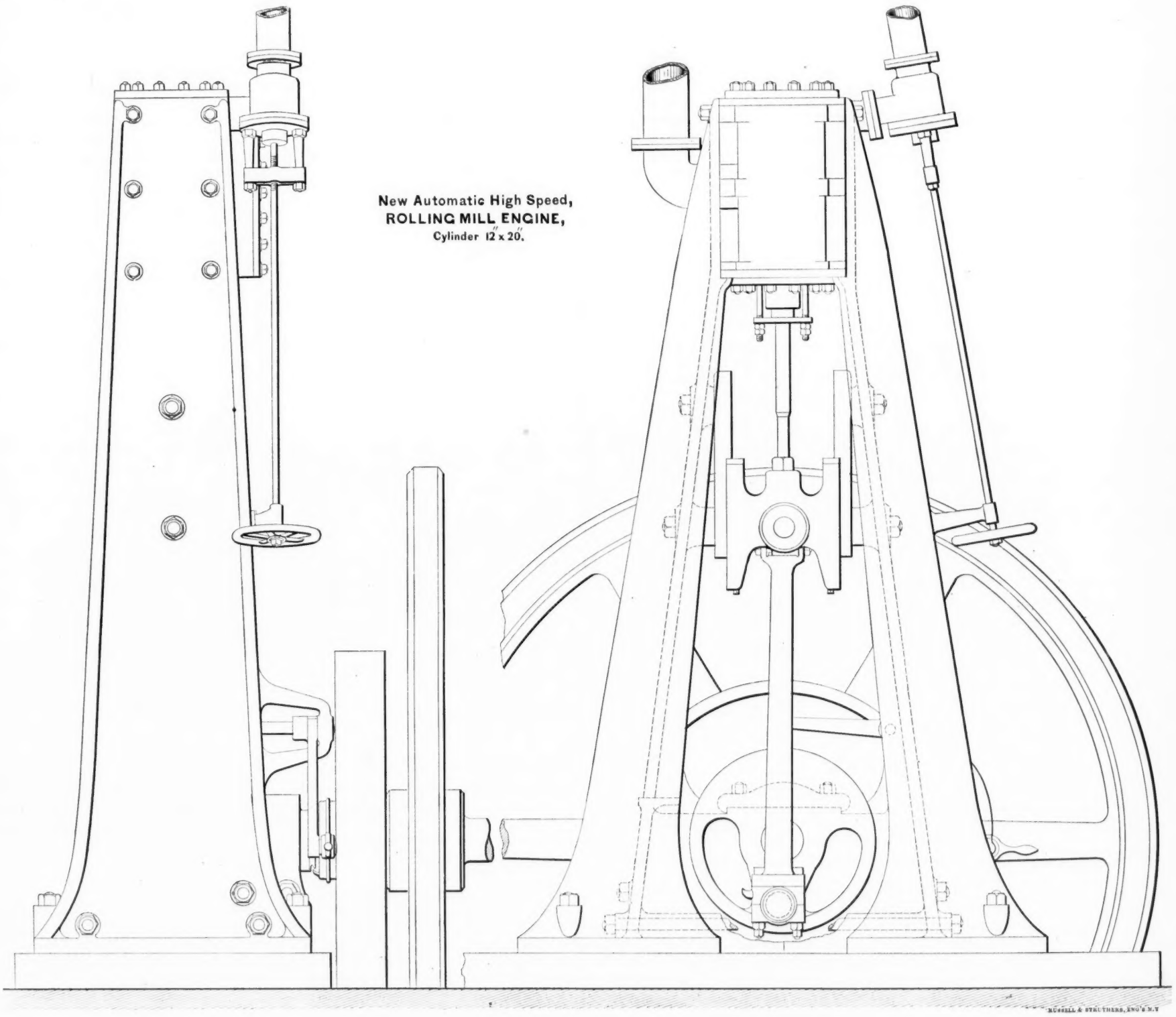
ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

New Automatic High Speed,
ROLLING MILL ENGINE,
Cylinder 12″ x 20″.



RUSSELL & ERUTHERS, ENG'S N.Y.

High Speed Automatic Rolling Mill Engine.

Our readers may remember that nearly two years since we mentioned the fact that at the works of the Sweet's Manufacturing Company, Syracuse, N. Y., a high speed automatic rolling-mill engine was being built from the designs of William A. and Prof. John E. Sweet of that city.

This engine which was built for direct connection to a roll train, having now been in successful operation for one and one half years, brief mention of which has previously been made in our columns, we this week redeem in part the promise made some weeks since to illustrate and describe its construction, by presenting on this page a front and side elevation of the engine. We shall follow this in another issue with detail drawings of the more important parts, together with such descriptive matter as may be necessary to explain their peculiarities.

Referring to the two views, it will be seen to be a vertical, direct-acting engine, with over-head cylinder and counterbalanced disc crank, being in these respects similar to a number of engines belonging to the company that has this one in use. It conforms, however, in its general features to the straight line horizontal engine built by the Straight Line Engine Company; that is, it is like this last-named engine in that the construction of the housing or upright frames (which correspond to the frame of the horizontal engine), is such as to resist all strains between the bed plate and the cylinder in straight lines. It is essentially unlike it, only in that it extends in a direction vertical, instead of horizontal.

The bottom of the cylinder rests on these housings or frames in a manner common to the vertical engine, and in addition to this the housings extend upward, and along the sides of the cylinder for its entire length, and are rigidly bolted to it as shown in the engraving. This makes the stationary parts above the bed plate substantially as if in one piece, and adds to the rigidity, so essential to a high speed engine. To complete the rigidity both the bed plate and housings are made of uncommon strength. The cylinder of this engine, which will be shown in section in our detail illustrations, is 12″ bore and 20″ stroke, and the crank shaft is 7″ in diameter in the body, and 7½″ in the journals, which are 12″ long.

It will be observed that making the journals larger than the body of the shaft is an entire reversal of the usual practice, and at first thought it may appear open to criticism. There were, however, two important considerations that led to the adoption of this feature of construction, and experience in this instance would seem to demonstrate that the points were well taken. One of these is the doing away with the possibility of the springing of the shaft in the length of the journal. In reference to this, since it is well known

that the shaft will spring from the weight of the attached parts, and from the strain of the work, it is manifestly better to provide for its doing so elsewhere than in the bearing, or where it will do the most harm. Instead, however, of saying that the journals are increased in size, so far as this purpose is concerned it would better express the intention to say that the shaft is reduced between the journals for the accomplishment of the end in view.

But there is another object in making the journals larger than the body of the shaft, which is that by this construction it is only necessary to make the boxes larger than the journals proper, leaving the projecting ends as small in diameter as the body of the shaft, to make of the box itself a most effective and simple oil reservoir, between which and the bearing there is no oil hole to become clogged and inoperative. In other words it would seem to provide for unfailing lubrication. This will be made plainer by reference to future details.

The fly wheel is in one piece, 10 feet in diameter, and as previously stated the shaft is coupled direct to a 9″ steel roll train which is run at from 225 to 256 turns a minute; corresponding to a piston speed of 750 to 853 feet. This will be recognized as high piston speed, but more particularly as a high number of revolutions for an engine running under the conditions of a rolling-mill engine: notwithstanding which there seems in this instance to be no difficulty whatever in its realization, the engine running quietly and noiselessly, and apparently with no more danger from heating or of breaking down than if run at one-half the present speed.

During the time this engine has been in operation there have been rolled with the train to which it is connected, in ten hours, 13½ tons of steel wagon tyre ¼″x1″ in size, and in 24 feet lengths; and in eight days of ten hours each, 82 tons of assorted stock, none larger than ¼″x1″, much of it ⅛″x1″, and some of it children's bicycle tyre.

Although this engine has been running day and night a considerable part of the time since going into use, it has caused no delays from breakdowns, and has cost substantially nothing for repairs.

Characteristics of Wrought and Cast Metals.

Some weeks ago in an action for infringement of a lead trap patent, brought before the United States Circuit Court, the expert testimony upon which the decision (involving about half a million dollars value) was mainly based was given by Thomas F. Hagerty, of San Francisco. We are indebted to Mr. Hagerty for a copy of his testimony, which covered every point at issue, and present some extracts from the same herewith.

"It is well understood that a wrought article or its equivalent cannot be made by any method of casting. A casting is always a casting, with all the peculiarities and distinctions and differences of structure which make it a separate and distinct thing from a wrought article. And the fact that a thing is made of wrought metal instead of cast metal is of itself sufficient, in most instances, to make it a totally different thing in its structure, in its properties and in its utility, just as much in very many cases as if it was made of a totally different metal. And, aside from this, the matter of economy of material when the difficulty of substituting wrought metal for cast is overcome, is even in itself a matter of the utmost importance in the trade.

"There is another property of wrought lead, as distinguished from cast lead, to which I have not thus far referred, and that is that it is not possible to cast lead articles of any given superficial area of the same thickness as those articles can be made of the wrought lead: thus, for example, a seamless lead trap —which is formed by forcing the metal through a die—is of necessity a wrought metal trap, inasmuch as the cast or crystalline structure is destroyed by the pressing and drawing action exerted upon the metal while being shaped. And this wrought lead trap may be made with walls of any desired degree of thinness; in other words, the wrought metal may be brought to the precise thickness which combined utility and economy may suggest, whereas with cast lead it is impossible to form a trap of the same size or diameter, with walls less than a given and greater thickness, and this ratio of thickness which cannot be diminished increases with the diameter of the trap, so that in the larger size and to a certain degree, even in the smallest size of cast lead traps, there is a certain waste of metal as compared with the quantity of metal required to make a wrought lead trap of the same size. In other words, the cast lead does not possess the property of being formed in the thin walls, which economy of material demands, while that desirable property is possessed by the wrought lead.

"On this head I am speaking from my own experience. I have made numerous experiments in past years in the casting of lead traps, and I find that when the lead is cast in in the cored mold (the mold has to be made with a core, otherwise the trap could not be made hollow), to the form of an S trap, the lead will not flow entirely around the core unless there is a certain space between the core and the walls of the mold, proportioned to the diameter of the trap to be made. The reason is that if this space be too narrow, the lead, passing in a thin stream around the core, will chill before it gets entirely around, so that the edges of the metal flowing to and around opposite cores of the mold will either not come together at all, or if they do come together will be so chilled that they will not unite. This lack of union is so common that it has received a distinct name for itself, namely: 'cold shot' casting. Such a casting is of course useless, and is only fit to be remelted. If the space within the mold, that is to say, the space between the core and the shell, or outside part of the mold is made sufficiently large to prevent this, then more lead is used to make the trap than is necessary for strength, and this excess of lead is of course just so much waste.

"If we try, as has been frequently done, to prevent this 'cold shot' casting by heating the mold so that the lead will flow around the core regardless of the narrowness of the space, a new difficulty is introduced; that is to say, the lead adheres to the hot metal of the mold just as tin adheres to the surface of sheet iron in the manufacture of sheet tin, and this, of course, not only spoils the casting but damages the mold. There is, therefore, this important distinction between wrought lead and cast lead in the manufacture of plumbers' traps, that wrought lead can be wrought into traps, having the walls just thick enough for strength and no more, without waste of metal, while, cast traps have to have an excess of metal in them beyond what is required for strength, and this is just so much waste of metal.

"Before the moulds are filled with the melted metal, they are, of course, occupied by air, inasmuch as it would be out of the question to work the molds in a vacuum. Lead is more easily oxidized when heated than any other of the common metals and this oxidization occurs almost instantly whenever a surface of melted lead is exposed to the air. When the lead is poured into the mold it comes in contact with the air contained in the mold, and a film or skin of oxide is formed upon it, and this either remains upon the surface of the edges of the lead and prevents the edges from joining, even when the lead has not cooled enough to form a real 'cold shot,' or it is broken up and divided into the mass of the melted lead and renders it brittle, just as antimony and many other impurities frequently render it brittle.

"Furthermore, this film or skin of oxide may itself sometimes remain intact, and stay in the lead as a foreign body, and make a hidden impurity, corresponding, as we might say, to a chip embedded in the lead, and liable at any moment to make itself manifest by a break in the casting under pressure. No such thing is possible when lead is wrought, by being forced under compression through a die in the more or less plastic condition in which it is subjected to that operation.

"Furthermore, cast lead has more or less of blow holes in it which may vary, from those almost imperceptible to the eye to those so large as to render the casting useless at the first view, but even the most minute of these blow holes are a source of danger, for they are likely to enlarge by corrosion, and a metal having even these minute blow holes is a very different metal for the practical purposes of the plumber, as compared with a metal from which such holes or air spaces are effectually excluded.

"There is still another difference between cast lead and wrought lead, as these are employed in plumbers' traps, and it consists in this: that the greater porosity of the cast lead, as compared with the wrought lead, gives it a relatively spongy texture, which exposes it to a much greater extent to the corrosive action of sewer gases and fluids, it being a truism in metallurgy that the more porous a substance the more readily is its structure attacked by injurious agents, inasmuch as the latter are capable of much more readily penetrating the substance of the metal, just as cast copper will absorb molten tin, or to use a more homely illustration, as a sponge will take up water. Another illustration of this same general truth: if we take a piece of roughly finished cast iron its surface will oxidize at once and to a material depth, whereas if we transmute the surface into even a thin film of wrought metal, it will remain dry and smooth for a considerable length of time.

"As concerns the conversion of cast lead into wrought lead: it is most advantageously and quickly performed in proportion as the lead is heated to approach the melting point, for in proportion to the heat the crystals are softened, so that the pressure upon them destroys their shape and character and the molecules of the metal are cemented together and brought into the peculiar fibrous structure inherent in wrought metal. This conversion of cast lead into wrought lead may be effected by forcing the metal cold through a die; but in so doing much greater pressure is required for the purpose, than if the metal be softened by heat. The process is facilitated, if we bring the solid cast metal nearly to the melting point, and force it through the die, in which case less pressure is required, inasmuch as the crystals yield to and are destroyed by a slighter application of force. If we desire to get along with the application of a still less degree of power applied to the metal, we can first melt the latter and then cool it just previous to its entrance to and its passage through the die. In this case the pressure is applied to the crystals, practically, as fast as they are formed and immediately after their formation, and inasmuch as they are in their softest condition at this initial stage, they are the more readily destroyed and the metal brought into a wrought condition, as they are forced under pressure through the die. The result of either of the just mentioned methods is the same, namely, a wrought product in which the crystalline and porous structure is destroyed, and a dense fibrous metal of totally different character in many respects is produced.

"The differences between wrought lead and cast lead are so great from a practical standpoint, that I find very few cast traps now in the market. A few may be sold in New York city, but even as far from the place of manufacture as the Pacific Coast, the cast lead traps are seldom seen in plumbing establishments, and they are conceded to be virtually superseded by the wrought lead traps formed by forcing the lead through a die.

"Any wrought metal can be melted by a proper degree of heat, and when melted and cooled will assume its crystalline state—in other words, will form a crystalline casting. This is the case with wrought iron as well as with wrought copper, wrought zinc, wrought lead and other wrought metals. And wrought copper, zinc, &c., are preferred by brass founders for making castings where purity of metal is required, inasmuch as the compression and drawing in the production of the wrought material mechanically eliminates foreign matters from the metal. As concerns iron, it is a common practice for manufacturers of sash weights to melt up the sheet iron of waste tin (which is the most thoroughly wrought variety of wrought iron) and other wrought iron scrap and cast it into weights. If the melted wrought iron were cast without admixture of pig iron, the castings would be too highly crystalline and brittle; to reduce this brittleness of the castings thus made from melted wrought iron some common pig iron is usually added."

Learning and Following a Trade.

A very general misapprehension seems to exist among apprentices, as to their duties, and the object of their apprenticeships. Nine out of ten consider that the entire object of their novitiate is to acquire a knowledge of the use of the tools of their trade, and facility in their handling, and that, with this acquirement, their trade is learned, and their apprenticeship ended; thus we have so many mechanics who, instead of being masters of their trades, have their trades for their masters. The mechanic who can use his tools only under the direction of an overseer, has not attained to the mystery of his business, and unless he does, he will be all his life-long a slave to the contingencies of mechanical demand. It is not to be supposed that every mechanic can be an overseer, but it is competent for every mechanic to be qualified, by his acquired knowledge, for the position, even if he does not possess the necessary natural capabilities to be a leader and a director. Not every skillful workman can manage the affairs of a shop, or direct a body of men, but he understands, as well as those who can, what is necessary to be done, and how it should be done. The market always, with rare exceptions and under peculiar circumstances, is glutted with unskilled labor, but it is seldom that a really skillful workman cannot procure remunerative employment. Such men are always in demand when there is work to be done. An employer prefers an intelligent workman, to the most painstaking and faithful laborer, who is but an animated machine. The day's labor should not be regarded by the workman simply as a task, and the hours spent in the shop as so many infractions of his general liberty. If he feels an interest in his work, the toil will be a pleasure, and the shop be considered a school. This interest can be created and fostered, by persistent effort, to understand the why of a job, as well as to know the how. All mechanical manipulations are founded on strictly scientific principles, a knowledge of which may be obtained from text books and manuals, and the possession of which will give an interest to what otherwise would be but a monotonous and wearisome drudgery. This knowledge will incite to improvement, and may lead to invention. A workman who is fertile in expedients, who is ready in emergencies, quick at suggestion, and apt at understanding present requirements, is invaluable in any concern. He cannot long occupy a merely subordinate position and rank among the drudges. *Calvert's Mechanics Almanac.*

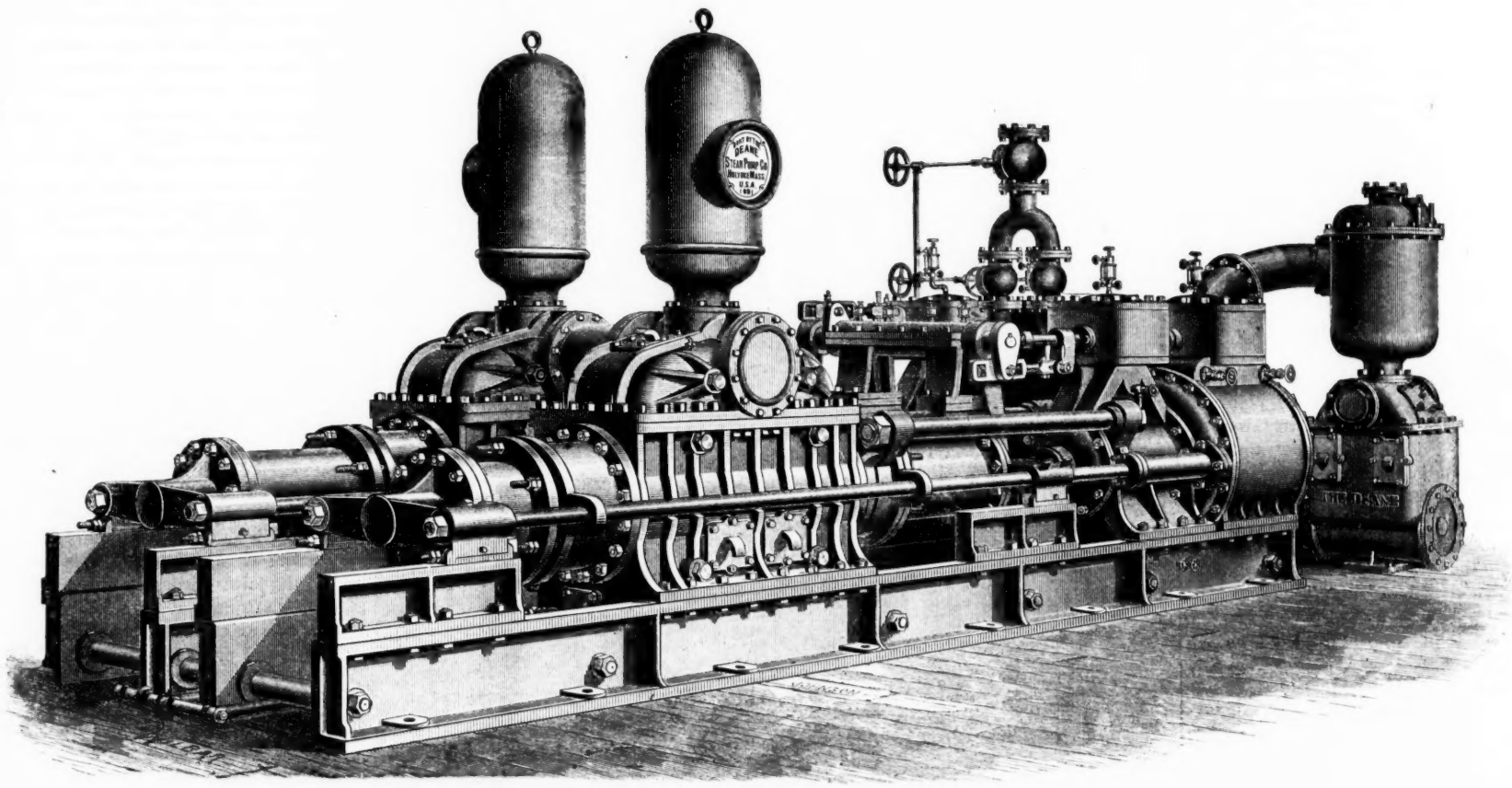
According to the N. Y. *Sun*, the Baltimore and Ohio Railroad Co. has built 25 palace cars of various kinds for use on its lines, at a cost of $12,000 to $15,000 each. The Wagner Sleeping Car Co. has about 250 drawing-room and sleeping cars running on different roads. Some of them are 76 feet long, and many are 65 and 70 feet long. They cost $16,000 to $17,000. Those that run between New York and Saratoga are gorgeously fitted up. They have private compartments, state rooms, card rooms, smoking rooms, and will accommodate 45 persons. The Woodruff Sleeping Parlor Coach Co. has a capital stock of $700,000, and now runs 100 cars, all sleepers. It employs about 300 men in its new car shops in Swissville, near Pittsburgh, Pa. Pullman's Palace Car Co., now runs 800 cars, and covers between 40,000 and 50,000 miles of railroad in this country. For five or six years it has had palace cars running in England, Scotland and Italy also, and is now building a large number of cars for foreign railroads. The cars built about the time of the organization of the company,

in 1867, cost from $25,000 to $30,000. They had sixteen wheels. Subsequently the size was reduced, and the cost was reduced to $18,000, and from 1874 to 1878, to $14,000. The present cost of a Pullman car is about $16,000, but the progress of the arts has secured greater finish and beauty than ever. The company is now building about 125 new cars.

New Compound Pumping Engine.

The improvement of the Mississippi River, which has been talked of for the past twenty years or more, is now assuming an active form, and special machinery is now being constructed for the purpose of carrying out what are considered the best suggestions for permanently improving the channel. During the freshet season the high banks of the river are washed down into the channel, from which the sand is deposited along the river forming bars and shoals.

The Mississippi Commission appointed by the United States Government, having been fully organized with Gen. Q. A. Gillmore as President, have decided to employ the following well-tried method for preventing the washing away of the banks of the river:



NEW COMPOUND CONDENSING DUPLEX OUTSIDE PLUNGER PUMPING ENGINE.

The banks are to be washed down by a process used in hydraulic mining operations, by firing a stream of water from a 2″ nozzle against the banks under a pressure of 200 pounds to the square inch. The high banks are to be reduced to a uniform grade of 1 foot to every 2½ feet. After the banks have been thus reduced, and the channel cleaned to the desired depth, mattrasses of coarse iron wire netting woven full of willow slips are to be spread along the sides of the channel, so that before the wire netting will have rusted away the willow slips shall have taken root and formed a permanent mattrass of roots, which will be a sufficient protection for the banks against the swift current of the river. To get the required pressure and quantity of water for washing down the banks it has been necessary to design a special portable plant of machinery.

A large scow or barge, 100 feet long and 40 feet wide, has been constructed to hold the 100 H. P. boilers, and pumping engine; also a pile driver and hoisting apparatus.

The engine is shown in the accompanying engraving. It was designed by C. P. Deane of the Deane Steam Pump Co., of Holyoke, Mass., and 92 Liberty st., New York, and was recently built at their works. It is styled by the designer a "compound, condensing, duplex, outside-plunger, pumping engine," which is rather a long name, but it correctly designates the machine. The high-pressure cylinders are 18″ in diameter, the low-pressure 36″, and plungers 16″, with a stroke of 24″. It is designed to discharge 2,000 gallons of water per minute through a 2″ nozzle under a pressure of 200 lbs. to the square inch as required by the commission.

The piston speed will be about 90 feet per minute. The frame or bed consists of four cast iron channel bars 30 feet long, strongly bolted together side by side by tie rods, and held in position by distance pieces. It will be understood that as this engine sits upon no foundation except the deck of the barge, it must be so constructed that when the barge changes its shape, as it always will, the alignment of the engine will be unaffected by such derangement, and must therefore be complete in itself. The piston rods of the low-pressure cylinders pass directly from the cross heads, through sleeves outside of the high-pressure cylinders, to the pistons within the low-pressure cylinders, thus avoiding all internal connections which are generally more liable to derangement than a simple stuffing box. The plungers are strongly supported by cross heads moving upon guides, and are provided with brass gibs which are easily and quickly adjusted.

The valve motion is very simple as may be seen in the engraving, and plain D slide valves are used. Cushioning valves are placed in the ports of the low-pressure cylinder, so that any desired adjustment may be secured. This engine is provided with a Deane independent condensing apparatus, such as was described in the AMERICAN MACHINIST of September 24, 1881, which maintains a constant vacuum when desired.

All parts of this engine are easily accessible when occasion requires. Its total weight is about 30 tons. The nozzle pipe is of iron, and having universal joints is supported by a crane. This pipe is about 90 feet long and can be adjusted to all heights, and can be pointed in all directions by the aid of the derrick and universal joints. This delivery pipe is to have a number of outlets to suit all kinds of work and positions. Each of these openings is provided with the standard hose fitting, for holding heavy nozzles, besides several of the outlets are to have Little Giant hydraulic machines affixed. We await the performance of this engine with interest.

A bridge over Murderers' Creek in the city of Newburg, New York, is being constructed for the New York, Ontario and Western Railroad, which, when completed, will be one of the largest in the country. It will be of iron, 1,200 feet long, and 150 feet high. It will be 680 feet longer than the Niagara Suspension Bridge, and about twenty-five feet higher than High Bridge over the Harlem. In height it will exceed the New York and Brooklyn Bridge, and will be 232 feet longer than the new London Bridge over the Thames.

Boring For The Pole.

A correspondent of the *Brooklyn Eagle* comes to the surface with a new project for reaching the pole. After condemning other plans *in toto* as not feasible (in which view there is little ground for disputing the correctness of his views) he intimates how the spindle is to be reached, which is by boring—in other words tunneling for it.

He doesn't clearly define just how he proposes to operate; probably it isn't necessary. He does, however, express a willingness to unfold the details before a public gathering, which we hope will consider the propriety of meeting on the ice—somewhere in Greenland—to listen to them. Of course the boring through a few hundred miles of ice, more or less, especially in the bracing atmosphere of the locality would be a trifling matter, and there ought to be no difficulty in getting up an International Stock Company, with a few hundred millions capital, to make the necessary surveys. The bore ought to be large enough for at least four tracks, because when a few enterprising individuals build a couple of dozen summer hotels, and establish the great polar watering place, they will be all needed by visitors to get away on.

Seriously, the *Eagle* correspondent's plan of reaching the pole is just as good as any other, and when the axis stands out at the end of his tunnel, the advantages will be just as great as if it were reached by any other means—as, for instance, in the imagination.

Hot Journals.

Undoubtedly it is better not to let a journal get hot than to devise ways to cool it afterwards. Notwithstanding this, however, it is well known that such things as hot journals are liable occasionally to trouble the most careful engineer. A journal may run perfectly cool for so long a time as to lead to the belief that there is no danger of heating, and all at once get hot and refuse to yield to ordinary means of cooling. Of course, in instances where it is not practicable to stop at the time, some means must be employed to keep it cool enough to run until it is possible to stop for examination and repairs.

Where there is no objection to the use of an abundance of water, this can generally be accomplished by keeping sufficient water on to absorb the heat as fast as generated. This is, however, only a temporary relief—a remedy to be employed until the time for applying the permanent remedy. Frequently an engineer will have a water pipe lead to some of the more important journals, and ready for the emergency; or, better still, a hose that may be led anywhere.

In many instances, a journal in some situation where water cannot be used to any extent on account of the damage to some of the products, will get hot. In a case like this it is often an undertaking of considerable difficulty to keep running. The remedies advised in such instances are numerous, and the difficulty is in depending implicitly on any one of them. Any or all of them may be good, and yet either of them may be entirely useless in any particular instance, and why it should fail in one instance and be all right in another can never be told. In any event it is always possible to assist matters by keeping pieces of wet waste—not saturated enough to drip—in contact with the box, changing them frequently as they get warm.

Sometimes changing the oil will have a good effect and sometimes it does not help matters. If the pressure is great, and the motion comparatively slow, it often has an astonishing effect to apply heavy cylinder oil, the great body of this oil tending to keep the metals apart. If, on the contrary, the pressure is light, and the speed high, it is better to try a lighter and more fluid oil than is being used. Of course the object is not to find the most economical lubricant, but to run the journal cool for the time being.

It is well to keep on hand for such emergencies plumbago and olive oil, which, mixed together as thick as can be used, sometimes produces the desired effect. Sulphur is good in some instances, and in others water with as much common salt as will be held in solution, applied liberally but not in quantities to do damage to the surroundings, will speedily set things right. The important thing to bear in mind is that although one thing known to be good fails, another one may accomplish the purpose.

The United States has been invited to take part in an industrial exhibition to be held in Amsterdam in 1883.

The main building of the Atlanta Exposition was sold for $25,000, and a company will be organized to use it for a cotton factory.

Rapid Pneumatic Transit.

Mr. W. Barnet Le Van read an interesting paper on Rapid Transit before a Franklin Institute audience in Philadelphia, one evening last month. We make some extracts from the paper as published in the *Philadelphia Inquirer*.

He took the ground that railway speed of from 100 to 150 miles an hour was not too high for the requirements of long passenger traffic; but such a rate of speed, he thought, would never be attained by the present railroad system. He was of the belief that the time was not far distant when railroads will be used only for the transportation of freight. Without fear of contradiction, he asserted that, in the near future, a trip to New York and return would occupy no more time than a trip, under present circumstances, to Germantown and return.

He spoke of the pneumatic system of transmission being the means of solving the problem of rapid transit. Trains on pneumatic roads, he said, are in no danger of obstruction from malice, snow, slides of earth, rocks or collision with men, beasts or vehicles, of running off the track, setting fire to buildings, stacks of hay or woods. Passengers would be free from cinder, dust or smoke. He thought by this arrangement a trip from Philadelphia to Pittsburgh, now occupying ten hours, would be accomplished in four hours. The system has the following advantages over steam-worked roads: It at once brings down the greatest necessary weight upon a wheel to about five thousand pounds, whereas the ordinary locomotives have about sixteen thousand pounds on a wheel. The strain upon the permanent way would be less than one half of that upon the elevated railroad now in use in New York city.

Mr. Le Van outlined a plan of a pneumatic system, to take the place of the proposed elevated railroad in Philadelphia. In conclusion he said:

"As I have above stated, stationary steam-engines must be employed in place of locomotives. It is not necessary for me to go into particulars to show that the work of 150 indicated horse-power stationary engine for ten hours a day does not involve one-half, nor probably one-fourth, the outlay incurred in the repairs of a locomotive working to the same power for, perhaps, five hours daily. Again, the boilers can burn the very cheapest kind of coal, where locomotives employ the best at double the price.

The first cost of a road of this kind and the rolling stock would be considerably less than an elevated railroad; and, by so removing them from public sight, their existence will almost be forgotten.

Some objections to underground roads may be raised on the ground of timidity of persons of nervous temperament of trusting themselves in them, which may appear at first thought, as was the case when the elevated railroads were first erected in New York city. Ladies at first would not ride on them; but now they are its most ardent supporters. It is wonderful how people, accustomed to treat such new ideas as absurdities, may and will become reconciled to and then go into ecstacies over them.

The first time that the pneumatic system was tried successfully for passengers was on October 10, 1865, when the Duke of Buckingham and several other gentlemen were blown from Holburn street station through the tube to Euston railway station, a distance of about two miles, the tube being four-and-a-half feet diameter, and having some sharp curves of less than 170 feet radius, in the short space of five minutes, being at the rate of 12 miles an hour.

The American Consul at Sydney reports that the Government of New South Wales is now importing some twenty or more American steam-motors for tramways, and it is understood that somewhat extensive sales of American watches, weighing machines, and various other articles have been made through the exhibitions in Sydney and in Melbourne, which will probably lead to an extended business.—*Chicago Journal of Commerce.*

Screw Cutting Engine Lathe.

In our issue of October 8, 1881, we illustrated and described a 14″ swing engine lathe, built by S. Ashton Hand, at Toughkenamon, Pa. Since then the patterns for this lathe have been thoroughly revised, and such changes as were suggested by experience have been made in the details of its construction.

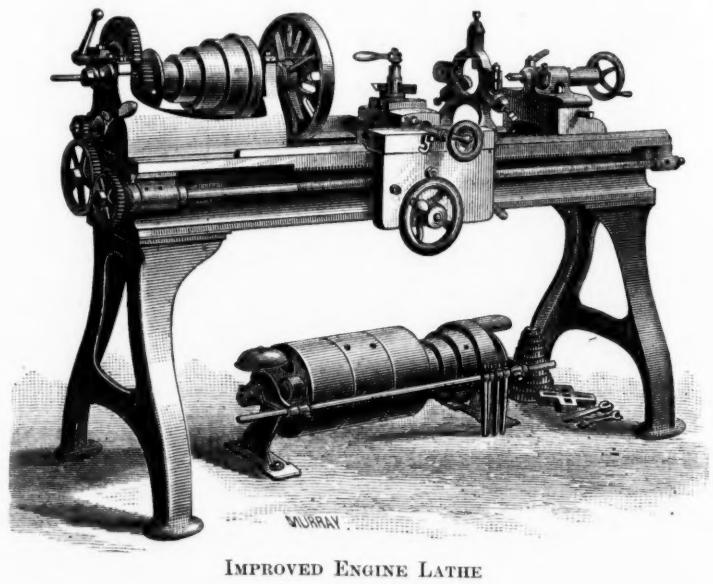
We present, this week, an engraving of this lathe as at present constructed, from which it will be seen, in comparison with the previous illustration, that hand-wheels have been substituted for the ball handles, and that the screw has been brought from the back to the front of the lathe. It is claimed that the present arrangement of the screw is much more convenient than the former one.

Another change that has been made is the substitution of epicycloidal teeth for the gearing. The head stock has also been materially strengthened and made of a more approved design, and other parts have been strengthened where it was found desirable.

For further details, reference may be had to our previous illustration.

A correspondent of the *English Mechanic* says:

I have tried chalk, soap, treacle, and rosin, to prevent slipping of belts, but like oiling belt on the inside just before I stop on a Saturday; it preserves belts and beats anything I have tried yet.



IMPROVED ENGINE LATHE

New Year Promises.

For an out-and-out spicy and sparkling "Trade paper" the *American Furniture Gazette*, stands unrivaled. Here is a part of its New Year "Leader":

"This being the 'Glad New Year,' and all that sort of thing, at which season it is customary for individuals, communities, etc., to review the past and make promises for the future, in deference to this custom we beg to remark, respectfully, but with firmness—we won't.

WE WON'T begin the New Year by firing at you a hundred-ton article as long as the Guiteau trial, and as dismal as one of Mark Twain's after-dinner speeches, heading it 'New Year's Greeting,' and trying to make you think it quite the thing required by the season. Not much. It's the proper thing to do of course, but we're not in the style just now. We don't want to kill you off too suddenly. We've further use for you.

WE WON'T worry you by telling what big things the *American Furniture Gazette* did last year, what a good paper it is, and all that. You know it already, or, if you don't, it's your loss, and you won't believe it anyhow because we tell it.

WE WON'T put ourselves on record for the future. It's a bad plan, as any politician can tell you, and therefore we will indulge in no promises. If we did, we might not keep them, and should do as we pleased about it anyhow, and then you might accuse us of lying. Therefore, no promises. If we *should* start out to tell you what we propose to do in this current year, in the way of improvements, we would have to use large expressions, and then you wouldn't wait till some distant day to accuse us of deceit. On the whole, it is safer to leave you to draw on your imagination as to what we intend to do, and then if we don't do it you can't blame *us*. But please to draw it large.

WE WON'T print any sermons this year. Our sermon editor has gone on a ten years' vacation.

WE WON'T stay too long on the same side of a question—the tariff, for instance. Our weight might settle it too soon, and that would leave the rival political parties without a live issue. Besides, there is no variety in sticking to your position too persistently, and we don't want to be accused of being monotonous. Consistency demands something, though, and if anybody can catch us on both sides of a question in any one issue we will pay a suitable reward on conviction.

How to Set and Start a Steam Pump.

In setting a pump it is of the *greatest importance* to have the suction pipe perfectly tight, *of sufficient capacity*, and free from obstructions. A foot valve and strainer on the bottom of the suction pipe is always a great advantage. Have the fewest possible bends in pipes. All bends in pipes greatly retard the flow of liquids.

Should the pump work unevenly at different parts of its stroke, or make its stroke one way much quicker than the other, or refuse to take water from the suction, it will be found either that some substance has lodged under the valves, thus preventing their closing, or that the pump gets air through some leak in the pipes, *or the suction pipe is obstructed*, and the supply of water to the pump is insufficient, either of which conditions will cause the trouble referred to. A suction pipe of too small capacity will always cause a pump to work badly, producing an uneven stroke and often a "thumping" sound.

An air chamber on the suction pipe close to the pump *is very desirable* (one made of pipe the same size as the suction does very well), and in drawing water long distances it is almost indispensable, as it carries a steady and uniform flow of the fluid through the suction pipes, thus preventing the "pounding" or "water hammer" usually incident to long suctions.

In working the hot water, the supply must *always stand above the level of the pump*, so as to flow to it readily. Hot water requires larger pipes than cold water.

Should the packing in the valve-rod stuffing box become too loose, thus allowing the steam, on which the valve cushions, to reverse the valve, thus causing the pump to miss its stroke (*i. e.*, to make part of its stroke and return), slightly tighten this stuffing box, so that the packing will produce a slight friction upon the rod.

Care should be taken that none of the stuffing boxes be too tight, so that the packing becomes hard or burned.

Always have the valve motion free, so as to turn easily, before starting the pump.

Use but little oil, and that best sperm or lard oil. Any oil that corrodes or gums the working parts is unfit for use.—*Indianapolis Mechanical Journal.*

The New York Secretary of State issued certificates to 3,414 new corporations in the year 1881, the fees amounting to $9,829.

"Buying coal by the pail and beer by the basket" is the cause of many a man's poverty.

Making Hay Rope Loam Cores.

BY THOS. D. WEST.

Hay, or straw, is wound around a core barrel for the purpose of venting the core, and allowing the barrel to be removed. When iron is poured around a hay rope core, it burns or chars the rope before the casting gets cold, thereby releasing the barrel so that it may be drawn out. With very large castings it is necessary to hoist the barrel out as soon as the iron is cool enough, for if left in till the casting is entirely cold the contraction of the casting will make it a hard job to get the barrel out. The rope also assists in holding the loam from dropping off the barrel.

In starting to put on the rope, tie the end with wire passed through two of the vent holes, and when the barrel is being revolved the moulder should keep the rope as tight as it will stand without breaking, so as to take all the stretch out of it. If the rope is put on slack it will be impossible to sweep up a true solid core.

When a core is large in diameter, it is best to have the rope pounded with a wooden maul as it is wound on the barrel. This will help to take all the stretch out of it. Should the rope break at any time while putting it on, take the end and let the barrel be turned back a little, thin out the broken ends for about a foot, twist them around each other and pound the splice so that it will not be any larger than the rest of the rope.

To fasten or secure the end of the rope when the barrel is covered, drive some nails through it and into the strands next to it. In putting the rope on the barrel, the barrel should be turned in the same direction it is to be turned when the loam is swept on.

When there is an offset or shoulder to be made on a core, or should the barrel be so small that one thickness of rope will leave too much loam, there can be another thickness of rope put on over the first. When doing this it is best to rub on some loam over the first layer of rope, so as to make a solid bed for the second layer. The first coat of loam that is rubbed on the rope should be very clayey and tough, and made so that it will work in between the joints and stick to the rope. If this first coat is not made to fill up all the joints and holes, the result will be a swoollen or uneven casting.

It is also necessary to take a brick or block of wood and press it hard against the loam while the barrel is being turned, and if not sure that all the cavities are filled, it is a good plan to take a $\frac{1}{4}$ inch or $\frac{3}{8}$ inch round iron rod and press it between the joints while the barrel is being revolved, and then fill up the crevices with loam. After this, take the brick or block to lay all the loose hay flat, and make a solid surface for the second coat of loam, which should be put on so as to leave about $\frac{1}{8}$ inch for the finishing coat. The second coat should be used as stiff as it can be worked, to prevent bagging.

It is sometimes best to use the sweep in putting on this second coat, so as to make an even surface for the finishing coat. As a general thing, the finishing coat cannot be put on until after the barrel has been run into the oven and dried.

When dry and hot, take it out of the oven, set it on the horses, as shown, and rough up the core with a brick so as to break the skin. Then take the smoke black off. Take a brush and wet the surface slightly just before putting on the finishing coat. This coat should be put through a No. 8 sieve, mixed thoroughly, and enough put on the board or sweep to complete the core. When all is ready, take both hands and rub on the loam while the helper is turning the barrel. The barrel should never be turned fast. When turned once around, make the balance of the loam thinner and go around again. As the circle is completed, pull back the board endwise while the barrel is yet in motion. By doing this no mark will be left on the core.

If you can finish the core in two revolutions, it will be smoother than if it takes four or five revolutions to do it. If there should be any rough places on the surface, instead of using a trowel, use a smooth, hard wood

block to smooth them with, dampening them with water and loam, and rubbing with the block till smooth and level.

If the core is large in diameter, it is best to keep the barrel turning slowly until the loam is set enough so it will not sag. If the barrel is stopped when the board is taken away, the core is apt to be out of round. In turning the barrel, never turn up against the sharp edge of the sweep, but towards the beveled portion, as shown. The thicker the casting the more body, or thickness of loam there should be over the ropes, especially if the iron is poured hot. When there is not enough loam over the ropes, the hot iron heats through the loam and burns the rope while the iron is yet liquid, and the iron will strain into the soft open places and the casting will have lumps on it.

To make a casting one inch thick, the core barrel should be about three inches smaller than the finished size of the core. This will allow 1½ inches on each side of the barrel for rope and loam. The size of rope should be about ¾ of an inch, which would leave ¾ of an inch for loam, ⅜ of an inch of which should be left for the finishing coat. For castings about 2 inches thick, one inch thickness of loam will be safe.

During the war, a firm in this country cast heavy cannons by coring them out to save some of the boring. The cores were swept up on a barrel, and instead of using hay rope, they used ropes made of hemp. There were coils of small water pipes in the core barrel and cold water was kept running in them to keep the core barrel cool.

To make an even, strong hay or straw rope requires some practice, and the longest hay should be selected to make it hold together.

The cut *D* shows a simple rope twister, and *B* shows the barrel mounted on horses, with the screws for gauging the diameter of the core. *H* is an end view of the same. All core barrels should be well supplied with vent holes. Under 8 inch diameter they can be made of wrought iron tubing. For small cores the hay can be put on the barrels without making it into ropes, as only a thin laying of hay is required. The same mixtures of loam that is used for brick loam work will generally do for this class of cores.

Salt as a Lubricant.

It is said that if iron or steel wire is immersed in a hot solution of common salt, and allowed to remain till the temperature of the wire is the same as that of the solution, the crystals will adhere to the surface with such tenacity as to form an almost perfect lubrication for future drawing. The practice of using brine, or salt and water, on hot journals is an old-time one, the result being good when they are hot (not warm.) The effect in both instances is probably identical.

About 30,000 people in the city of Buffalo derive their support from the railroad companies. The amount expended there by the different roads in wages alone will foot up over $3,000,000 annually. During the past year over $1,000,000 have been expended in that vicinity for improvements.

According to the *Railway Age*, 29 railroads were sold under foreclosure during 1881, aggregating 2,617 miles of track and representing $51,277,661 capital stock; their bonds and debt amounting to $76,644,936. In commenting upon the showing the *Age* says:

"The past year has been one of such general prosperity, and capital has been invested so lavishly in new railway enterprises, that the general impression doubtless has been that the era of railway forclosures was ended, and these totals will be not only surprising, but perhaps discouraging to some. It should be remembered, however, that the bankruptcy of these roads commenced years ago, and that they have been dragging along through the slow progress of receiverships and foreclosure suits to the inevitable, though long-deferred, result of sale and re-organization."

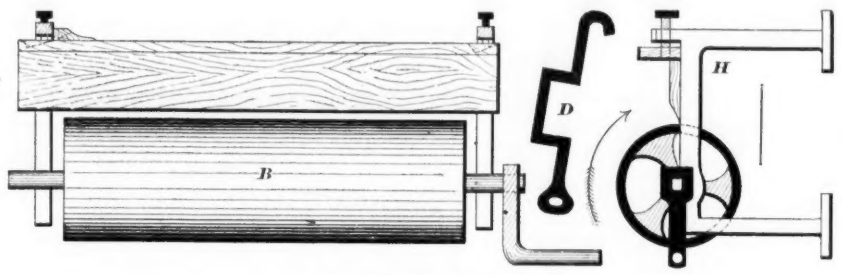
It is proposed to hold an international scientific congress, in connection with the metallurgical exhibition to be held in Spain next May.

LETTERS FROM PRACTICAL MEN.

Steam Engine Economy.

Editor American Machinist:

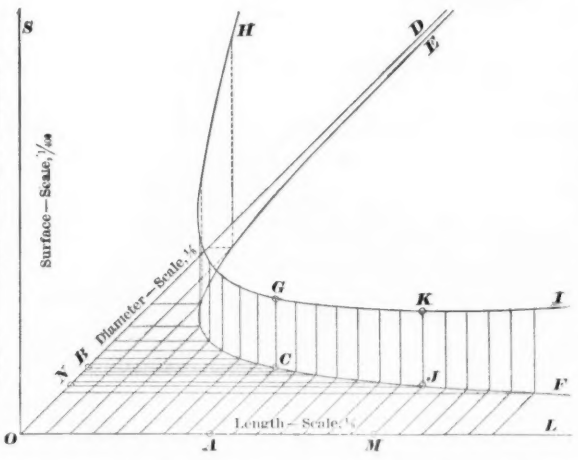
Among the thousand-and-one questions which require the engineer's attention in the solution of the problem of steam-engine economy, there is one which, it seems to me, is worthy of consideration, but one which is generally ignored, not understood, or there



HAY ROPE CORE.

are other considerations overruling this one. Hence, allow me to present the subject, in a few words, in the form of a query; then, if there is anything wrong in the idea, we will soon hear of it.

I refer to the condensation, or cooling effect, and consequent lowering of pressure, of the steam in coming in contact with the metallic surfaces of the inside of the cylinder. Can this surface be reduced and a saving of steam effected? It seems reasonable that every inch of cooling surface we can take out of the cylinder will add *some* to the mean pressure which would otherwise not be realized.



At present engines are building with no fixed relation of the stroke to the diameter of the cylinder, and it is evident that any number of engines can be built, all having the same power and speed, and yet no two have the same proportions of diameter and stroke. This can be readily seen by the following equation:

$$W = p \times v$$

in which W represents the work performed per stroke by any engine, p the mean effective pressure, and v the volume swept through by the piston; that is, the work performed during one stroke is equal to the mean effective pressure multiplied by the volume of the cylinder, regarding the *stroke* as its *length*. Now, regarding p constant, we see that W will be constant as long as v remains the same. But we could build an infinite number of engines, whose volumes would all be the same, and yet no two of them have the same diameter and stroke,

Now, which one of these infinite number of engines has the least condensing surface in its cylinder? It seems to me this is the one we want to build in order to condense the least amount of steam in the cylinder, other things being equal. By the aid of calculus, this becomes a very simple question to answer. This valuable friend tells us that a cylinder of a given volume, with two cylinder heads and two piston surfaces, has the *least surface* when the length (or stroke) is equal to twice the diameter. Without entering into a detailed explanation of this, I will simply give the above diagram, which shows at a glance the relations of surface, diameter and length of a cylinder, whose volume was chosen to be 100, whatever change there may be in the length and diameter. *E C F* is the length and diameter curve, and *H G I* the surface curve. Thus, the lines drawn parallel to *O L*, are the *lengths* of cylinder—drawn to a scale of ½ —those parallel to *O D* are the *diameters*, and the vertical lines (parallel to *O S*), meeting the curve *H G I*, represent the *surfaces*—drawn to a scale of $\frac{1}{400}$. For instance, if we assume any point, as *J*, on the lower curve, then will $N J = O M$ be the length, $M J = O N$ the diameter, and *J K* the surface of cylinder whose volume is as stated. Now the shortest surface line is *G C*, corresponding to a point on the lower curve, which gives a diameter *A C*, equal to one-half the length, *B C*. For any other proportion of diameter and length we get a surface line longer than *C G*, which continually increases as we recede from the point *C*. Hence, the stroke should be equal to twice the diameter, in order to have the least condensing surface in a cylinder. We notice that by increasing the *length* beyond the point *C*, the surface increases rather slowly, but by increasing the *diameter* beyond the point *C*, the surfaces increases much more rapidly.

To find the diameter of a cylinder for an engine of a given power, multiply the number of horse power by 126050. Then divide this product by the product of the mean effective pressure multiplied by the number of revolutions per minute. The cube root of the quotient thus obtained will be the diameter in inches. This multiplied by 2, will be the stroke. Example:—50 horse power. Mean effective pressure 30 lbs., 80 revolutions per minute.

Diameter $= \sqrt[3]{126050 \times 50 \div 30 \times 80} = 13.79$ inches.

Stroke $= 13.79 \times 2 = 27.58$ inches, or 14×28 inch cylinder would be the size desired.

Ordinary Cylinders.		Condensing Surface.	Proposed Cylinders of Equal Power		Condensing Surface.	Difference Between Columns 3 and 6
Diameter.	Stroke		Diameter.	Stroke		
1	2	3	4	5	6	7
6	14	376.	6.25	12.5	368.	8.
12	36	1809.	13.74	27.48	1776.	33.
16	24	2010.	14.53	29.06	1991.	19.
18	24	2375.	15.72	31.44	2330.	45.
20	24	2765.	16.86	33.72	2681.	84.
20	30	3141.	18.17	36.34	3112.	29.
22	30	3594.	19.36	38.72	3534.	60.
24	30	4071.	20.52	41.04	3968.	103.
26	30	4570.	21.63	43.26	4410.	160.
28	34	5454.	23.71	47.42	5299.	155.

The first and second columns of the above table are some of the sizes of engines built by several prominent engine works. The third column shows the amount of condensing surface in the cylinders of these engines. Columns 4 and 5 show the diameter and stroke of the proposed cylinder equal in power to those of the first two columns. Column 6 shows the condensing surface of the proposed cylinder, and column 7 is the difference between columns 3 and 6. The amount of condensing surface could be reduced in the ordinary cylinder by making the stroke equal to twice the diameter.

For convenience this table was calculated under the supposition that there is no clearance between cylinder head and piston,—regarding the length of cylinder equal to stroke Otherwise it would simply add a trifle to columns 3 and 6.

It has also been assumed that both cylinder heads and piston are perfectly straight on the inside. Any other form would only be adding to the condensing surface without any practical gain in any other direction. We occasionally see some very "scientific" pistons. They run down, in the center, halfway to China, and then back by way of a "parabolic curve of uniform strength." The head is made the counterpart to conform to it.

Deep counter-bores with cylinder heads extending correspondingly into the cylinder add four bands of condensing surface, and hence should be reduced as much as possible.

VOTRE AMI,
Providence, R. I.

Single and Double Cutting Tools.

Editor American Machinist:

Allow me to offer a little theory and practice in regard to many fine teeth as against few coarse ones in milling cutters. Chordal's theory seems to be in favor of lots of teeth, while in practice it seems that *more* work can be done with a single tool in a shaping machine than in any other way. The fastest gear-cutting I ever saw done was accomplished with cutters having only five teeth. In that shop the practice was to have just teeth enough, so that one tooth entered the cut as the tooth in advance cleared. They preferred to have fifty teeth on ten cutters rather than all on one.

While running a shaft lathe with two tool posts I developed the following facts: First, I rigged up a tightener back of the belt, so that the tension of the belt could be regulated and measured. Putting in a piece of work (3½″ shaft), I set one tool to take a half inch cut, regulating the tension of the belt to just drive the lathe. After cutting a short distance I set the second tool, withdrawing the first so that each would cut ¼″, thereby dividing the work previously done by one cutting edge between two. Mr. Editor, just as soon as that second tool got fairly started, it stopped, and it required an additional weight of seven-tenths of the former amount, to make it go. A number of experiments developed the same result in every case. From this I established the rule that, supposing a small tool to do an amount of work represented by 10, to do the same work with two tools will require a power represented by 17.

HERBERT S. WILSON.
Kalamazoo, Mich.

Overhead Direct-Connected Engines.

Editor American Machinist:

In reply to the letter of Mr. C. C. Hill, of Chicago, Illinois, in your issue of December 24th, I have a large number of the style of engines with crank attached to end of line shaft, and many of them have been running since 1845, and are in good working order yet. I have several on the line of the Erie Railway, at Elmira and other stations. The engines have been very successful and gave entire satisfaction in every instance. They were built without guides or slides, the piston rod being long enough to extend beyond the cross head and pass through a box. The connecting rod was forked to pass the guide box and reach the cross head, fastened in the centre of piston rod. I have one of the engines now running my works, which has been in use 25 years and is in good working order to day. The cylinder has never been rebored and is as perfect as a mirror.

WM. B. DUNNING.
Geneva, N. Y.

Setting the Valve of an Engine.

Editor American Machinist:

My method of setting the valve of an engine is as follows:

Before the cover is put on the steam chest I disconnect the eccentric rod and take a piece of very thin tin and put in the port and move the valve up against it. I then take a sharp pointed tram, that will reach from some fixed point on the steam chest, where I have made a fine prick-punch mark to any convenient part of the valve stem, and there make another prick-punch mark; then I put the tin in the oposite port and move the valve against it, and then with the tram in the same point on steam chest make another prick-punch mark on the stem. When this is done I put on the cover and connect the eccentric rod.

To find when the crank is on the exact center, I bring the cross head to within about half an inch of the end of its travel. I take a pair of dividers, and from a point on the cross head I strike a segment of a circle on the guides, and, before moving the engine, I make a tram that will reach from the floor or wall to the fly wheel, and make a mark on the wheel. I then move the engine in the direction that it is to run, until the cross head has passed the end of its travel and returned to a point where the dividers will again intersect with the segment already made on the guides. I then with my tram make another mark on the fly wheel, and just midway between the marks I make a prick-punch mark as a dead-center mark, and then repeat the operation at the opposite end of guides. The next move is to bring the fly wheel to a point so that the point of the tram will just enter the dead-center mark, and the crank is on its exact center.

I then take the tram that I used to mark off the valve stem and place the point of tram in the punch mark on steam chest, and make a mark on the valve stem; then move the fly wheel until the other dead-center mark is reached, and again mark the valve stem.

Then compare the marks on valve stem with the punch marks, and lengthen or shorten the eccentric rod as the case may be, to bring them to an equal distance from the punch marks. If more or less lead is desired move the eccentric and, to see that you have just what you want, place the tram in the center on steam chest, and compare the point with the prick mark, and the difference will be the lead, if the difference is between the center marks, for if outside it would show that the valve covered.

In all cases move the engine in the direction that it is to run, and if by accident it is moved by the dead-center mark, it must be backed up far enough, so that when you move forward again, all lost motion will be taken up before reaching the mark.

H. REYNOLDS.

Ithica, N. Y.

Computing the Power of Engines.

Editor American Machinist:

I never could see any good reason for rating a 7″ cylinder engine at 12 horse power, or a 10″ at 20 horse power, as is customary with manufacturers.

The utility of the table below seems to me as obvious as that of one showing the varying power of different sized water-wheels working under different heads of water.

In computing this table, standard rules have been employed, and in order that the estimates may not be too high, a deduction of 20% of the gross power of each engine is made to cover the item of friction, which is more than is usually allowed.

The steam pressure, as given here, is the mean or average per inch on piston, and not the Boiler pressure as shown by Steam Gauge. This average can only be obtained by applying a Steam Engine Indicator; this often shows a difference of 25% in the efficiency of two engines; the inferior one, perhaps, having the best outward appearance. So that it is not safe to guess at the average pressure in an engine that has not been tested in the proper way.

To get the speed of piston in feet, multiply the number of revolutions per minute by twice the stroke in inches and divide this product by twelve.

QUIRK,
Chattanooga, Tenn.

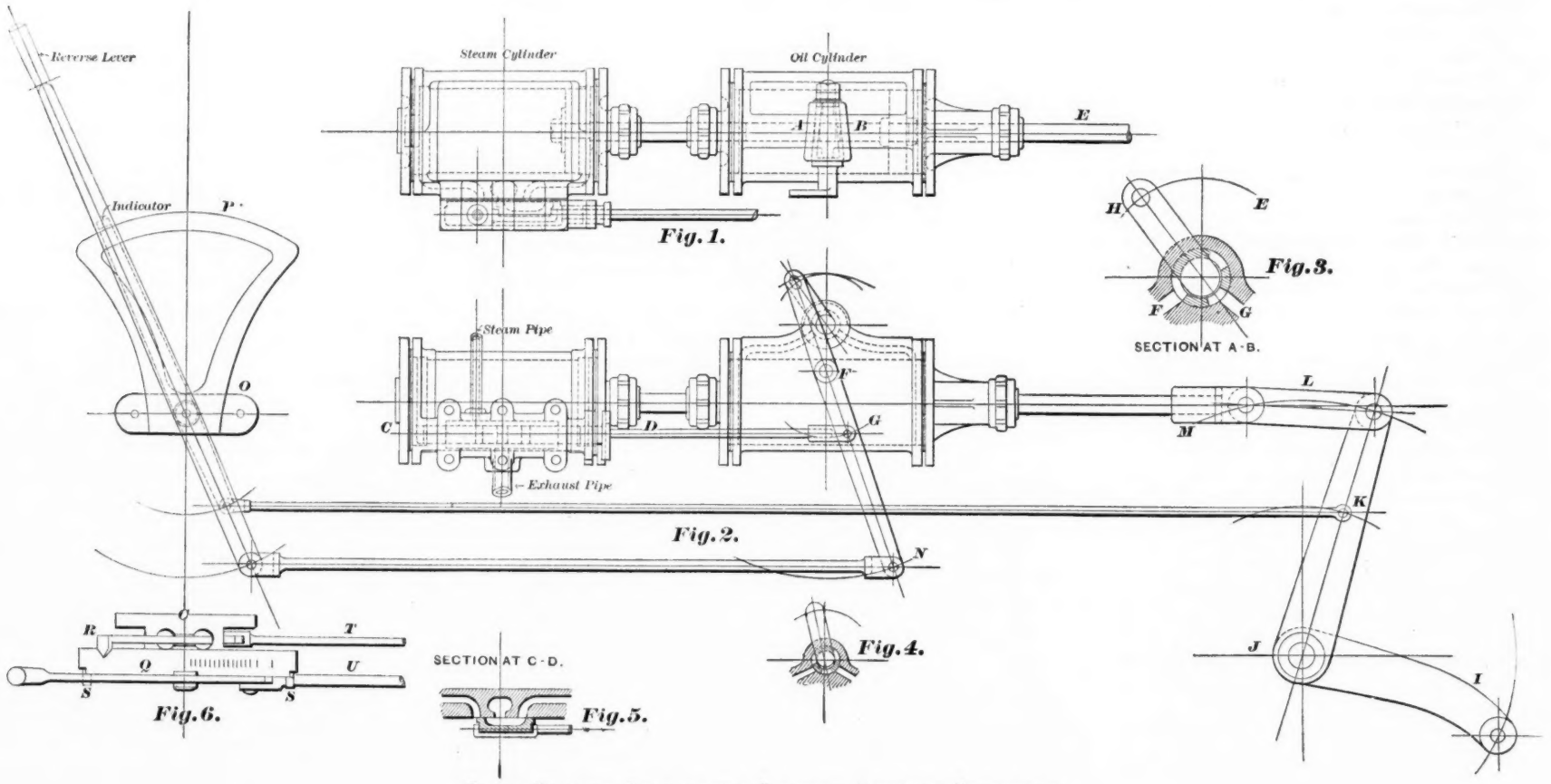
Sizes and Taper of Keys.

Editor American Machinist:

Having seen several articles in your valuable paper on Sizes and Taper of Keys, I would like to say a few words on that subject. I have used a certain rule for sizes and taper of keys for the last twenty years, and find it correct as regards usefulness of keys. All keys should be one-third the diameter the hole in breadth, and one-sixth the diameter the hole in thickness at the head, with a taper of one-tenth of an inch to one foot.

There is far to much chance system of key making. I notice one of your correspondents gave some of his experience in key fitting. The old gentleman, his employer, would have it fitted tight on the sides. If any one should compel me to do such a job, I would pick up my tools and shift,—not that a key should not fill a key-bed, but it should be only tight enough to be pushed by hand. What is wanted is friction, and we must have a pin or key heavy enough to stand driving, according to the size of shaft and work to be done. I fitted up shafting in a factory in Scotland and did not use a key in any of the pulleys; they were all bored larger than the shaft, with a taper of one-eighth of an inch to one foot. A bushing was made to fit the shaft and tapered to fit the pulley, then cut into three pieces. It is the finest running shafting I have seen anywhere. The reason our pulleys were bored so large was owing to the way they put on the couplings. Instead of turning them small as they generally do in this country, they had them much larger, for reasons I will hereafter speak about.

ANDREW SANGSTER,
Sherbrooke, Canada.



STEAM REVERSE GEAR OF THE SWIFTEST AMERICAN LOCOMOTIVE.

Diameter of Cylinder in inches.	Speed of Piston in feet per minute.	HORSE POWER WITH STEAM PRESSURE AT 20	30	40	50	60	70	80 lbs.
4	300	1.82	2.73	3.64	4.55	5.46	6.37	7.22
	350	2.13	3.19	4.25	5.31	6.37	7.43	8.52
	400	2.42	3.63	4.84	6.00	7.26	8.47	9.68
5	300	2.85	4.28	5.71	7.13	8.56	10.00	11.41
	350	3.33	5 00	6.66	8.32	10.00	11.65	13.32
	400	3.08	5.70	7.61	9.57	11.41	13.32	15.22
6	300	4.09	6.13	8.18	10.22	12.27	14.31	16 36
	350	4 79	7.18	9.58	11.77	14.37	16.76	19.16
	400	5.45	8.17	10.90	13.62	16.36	19.08	21.81
7	300	5.59	8 30	11.19	14.00	16.79	19 58	22.38
	350	6.52	9.78	13.05	16.33	19.58	22.85	26.11
	400	7.45	11.18	14.90	18.63	22.36	26.09	29.81
8	300	7.31	10.96	14.62	18.27	21.93	25.58	29.24
	350	8.52	12.79	17.05	21.32	25.56	29 82	34.09
	400	9.74	14.62	19.49	24.36	29.24	34.11	38.98
9	300	9.25	13.87	18.50	23 13	27.75	32.38	27.00
	350	10.79	16.18	21.58	26.97	32 33	37.67	43.16
	400	12.33	18.49	24.66	30.82	36.99	43.15	49.32
10	300	11.42	17.13	22.84	28.56	34.27	39.98	45.69
	350	13.32	20.00	26.65	33.32	39.98	46.64	53.31
	400	15.23	22.84	30.45	38.08	45.68	53 30	60.91
11	300	13.82	20.73	27.64	34.55	41.46	48.37	55 28
	350	16.12	24.18	32.25	40.32	48.37	56.44	64.50
	400	18.42	27.64	36.85	46.07	55 28	64.50	73.71
12	300	16 44	24.67	32.89	41.12	49.34	57.57	65.79
	350	19.19	28.78	38.38	47.97	57.57	67.16	76.76
	400	21.93	32.89	43.86	54.82	65 79	76.76	87.72
14	300	22.38	33.58	44.77	55.97	67.16	78.36	89.55
	350	26.12	39.18	52.24	65.30	78.36	91.42	104.48
	400	29.85	44.77	59.70	74.63	89.55	104.48	119.42
16	300	29.24	43 86	58.48	73.11	87.73	102.35	116.97
	350	34.11	51.17	68.23	87 29	104.35	121.41	135.47
	400	39.00	58.48	77.98	97.48	116.97	136.47	155.96

New Steam Reverse for Locomotives.

In the AMERICAN MACHINIST of January 7, 1882, we published a detailed description of The Swiftest American Locomotive, No. 169, now running upon the Central Railroad of New Jersey. We publish here, with an engraving, a description of the steam reverse used upon that locomotive. It consists of two cylinders one for steam and the other for oil. The piston in each cylinder, as will be seen from the engraving, is attached to a single piston rod, E, which is connected with the lifting shaft J, by means of the jaw M, and pitman L. The links are suspended from the arms I. The reader will observe that on engine No. 169, in order to raise the cylinders to the proper level upon the side of the boiler, a lever has been interposed between the upper end of lifting shaft and pitman L

which reverses the motion. This will be easily understood, by an inspection of the engraving of the locomotive in the AMERICAN MACHINIST.

In the engraving, Fig. 1 represents a plan and Fig. 2 an elevation of this steam reverse. The dotted lines plainly show the internal arrangement.

The oil cylinder has a port running from end to end with a plug stop cock in the middle. The oil cylinder is kept full of oil at all times, being filled through a cup placed upon the port, so that it is impossible for the piston to move except when the plug cock is opened. This arrangement is shown in Fig. 4. In filling the cylinder, a small vent plug in the highest part of the port is removed, to allow the air to escape and the cylinder allowed to fill full of oil. The steam slide valve and plug cock are operated simultaneously by being connected with the lever G which works upon the pin F.

A quadrant P Q, is placed in the cab and is bolted to the boiler by the foot O C. The small reverse lever is operated the same as the usual reverse lever and in the same directions, being connected with the lever G by the rod N U.

An indicator R is also located upon the same pin as the reverse lever, inside the quadrant, for indicating the position of the links and point of cut off at all times.

This is done by means of a connection through the rod K T, with the lifting shaft, and the graduations upon the quadrant show the point of cut off.

To reverse the engine throw the reverse lever in the direction desired until it strikes one of the stops S, which will place the steam valve and plug cock in the position shown in Figs. 5 and 3, and when the piston has moved its full stroke place the lever in the notch at mid gear.

In adjusting the cut off, the reverse lever is moved in the same manner and when the point of the indicator shows the desired cut-off, place the lever at mid gear.

The slide valve upon the steam cylinder is placed low so as to drain all water of condensation from the cylinder. Some of the advantages of this reverse are that any desired point of cut-off may be used, which change would require the shifting of the lever from one notch to another in the ordinary reverse lever. This is often very troublesome where there are an insufficient number of notches in the quadrant, and necessitates a partial closing of the throttle.

The plug cock locks the oil so as to hold the links in any desired position for any length of time. By the arrangement of the reverse upon engine No. 169, the reverse gear is handled with the two motions so that engineers are not likely to become confused when in danger of collision or of obstructions. Locomotives having unbalanced slide valves are handled with the greatest ease by means of this steam reverse. It is the invention of William P. Henszey, of the Baldwin Locomotive Works, Philadelphia, Penn.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE AMERICAN MACHINIST.

Continued from Last Issue.

The Whittier Machine Company, Boston, Mass., write us:

We are very busy in all departments of our works; we have more work on hand than we can do without running our boiler and machine shops to their fullest capacity, and we have orders ahead which will keep us fully occupied for several months. The prospect for the coming year is very encouraging.

The Ludlow Valve Manufacturing Company, Troy, N. Y., write us:

The demand for our valves and hydrants during the year 1881, and, in fact, for the past two years, has been such that it has not been possible to fill orders with our accustomed promptness, although working a large force and overtime. We have enlarged our foundry twice during the past year. We are about to make a large addition to the works to accommodate the new machinery now being made for us. We have no traveling men, and are constantly working on orders.

L. Coes & Co. (wrenches), and Loring Coes, & Co. (machine cutters), Worcester, Mass., write us:

Our business the past year has been very satisfactory, both in our wrench and knife manufactories. Early in the year we completed an important improvement in the construction of our wrench, and have been unable to supply the demand for them the past six months, although since August 1st we have run our works from eleven to thirteen hours per day. The advance in price of iron and other materials forced us to advance the price of wrenches, August 12th and Nov 23d. We have orders now booked which will take us several months to complete. Usually at this season of the year we are "stocking up" for spring trade. At present all our efforts are directed to dealing out to our customers enough wrenches to supply their immediate requirements. At our knife works we have increased our plant and labor about one-third. The call for hay-cutter knives has been fully a third more than ever before, while the demand for cotton and woolen shear blades and strips, shoe die and moulding cutter stock, &c., has never been equaled in our thirty years' experience. We are now, and have been for six months, running our works eleven hours per day, and have orders booked that will keep them humming for three months at least. We reciprocate kind wishes, and accompany with them our congratulations on the success of your efforts, in giving us what we consider the best paper published for a mechanic to read and get all he can reasonably ask for.

The Boston Blower Co., (Blowers and Exhausters), 2 Foster's Wharf, Boston, write us:

The year 1881 has been a very busy year with us. The amount of work turned out has considerably exceeded that of any previous year, and has been limited only by our contracted quarters. The prospect is so encouraging ahead that we have purchased 50,000 feet of land, and expect to erect a shop at least twice as large as our present one, near the city, and on two railroads with tracks in the yard, early next season. Our orders for blowers, exhausters, printing machinery and experimental machines of various styles, patterns and sheet metal work come faster than we can execute them. We cannot tell how long this will last, but can discover no signs of any change.

Wm. T. Bate & Son (Iron Founders, Boiler Makers and Machinists), East Conshohocken, Pa., write us:

Our business for the past year has been exceedingly good, having been kept as busy as could be manufacturing our Patent Steam Generators, and been pressed with orders during the whole year. We now have orders on hand that will take us at least six months to fill, and the prospect for the coming year is even better than the past.

We are now thinking of enlarging our works, in order to meet the demand and fill our orders more promptly.

L. Katzenstein & Co., 35 Desbrosses St., New York, write us:

Our business is better than it ever was before in ten years. We have been busy during the whole year, especially the last three months. The orders are coming in very freely from every part of the civilized world, principally from England and Germany, Italy, Austria, France and, certainly most of all, from every part of the United States. Nearly all the principal engine builders have now adopted our packing for their engines, either using it themselves or recommending it. Ninety per cent. of all new steamers built this year (1881) here, or in Great Britain, have been fitted up with this packing. At present writing we have orders on hand for the new Cunard steamer Servia; Hamburg-American Packet Co.; new steamer Bohemia, and five more European steamers; also for three steamers, built by John Roach & Son. All these steamers are to be fitted with our Packing all through the engine. We also have many orders for Stationary Engines. We have sold about five times as much Metallic Packing this year as in any other year. We have had to put up more tools, and enlarge our shop. Bills have been paid quite well, and taking everything into consideration we are well satisfied with business this year, and hope it will continue so next year.

The Brady Manufacturing Company, Brooklyn, N. Y., write us:

The past year's business has been the largest in our experience; have employed about one hundred men; are now increasing our facilities as fast as we can get in new machinery. Every department is pushing us—notably, the electric light apparatus department, the demand for which is increasing *enormously*. On emery grinders we are three months behind on orders. The same can be said in our "hardware department." We are delivering two hundred of Morill's Perfect Saw Setts a day, which is less than half enough to keep up with orders. Collections are satisfactory. In fact, the only unsatisfactory feature is the difficulty in getting stock and machinery.

The Bridgeport Boiler Works (Lowe & Watson proprietors), Bridgeport, Conn., write us:

Never have we had so much business as now, nor ever so far behind our orders. In yard and shop we are doing all we can to catch up. Shall load 8 cars next week with boilers and furniture, all Lowe patent boilers; all so large that only one boiler and its furniture can be loaded on one car. We are working with all our might and means to get up to our orders, and sometimes we think we shall, but orders come in so fast that we shall not get ahead of them for a good while yet. We have nothing made up for sale, and have lately been obliged to let some of our good patrons purchase boilers elsewhere, because we could not supply them to meet their requirements on time; but we are increasing our power and facilities, and shall soon be able to do more work. The prospect for orders for this year was never better, and we think our business will continue to be good.

The Oneida Steam Engine and Foundry Co., Oneida, N. Y., write us:

Our business for the past year has been fifty per cent. greater than in 1880, far exceeding our expectations. The great demand for the Westcott Chucks has compelled us to give our exclusive attention to their manufacture. Our works have been enlarged and our facilities increased two-fold. We have made every endeavor to get a line of stock ahead, and find it so far impossible, but with more additional machinery which we are about contracting for, we expect to be able to fill orders more promptly. Our export trade has largely increased, having orders ahead for shipment to England, Germany and Russia. We are giving more attention to the use of slide gauges—and have improved the workmanship on our Chucks considerably in the past six months. The outlook is promising for a good trade the coming year.

Beecher & Peck, New Haven, Ct., write us:

The business of the past year, more than exceeded our anticipations. We were obliged during the year to increase our facilities and build us a new factory, into which we moved in July, adding the department of drop forging to our business of manufacturing the Peck Drop Press.

During the latter part of the year we were running 12 hours per day in both departments, and are now, and our orders are flowing in in abundance, making the outlook for the present year very promising.

Gardner C. Hawkins, 36 and 38 Oliver St., Boston, writes us:

At the close of the year 1881 we find this to be our best year since 1874, when I commenced the manufacture of blowers. Our sales average more monthly than the entire sales of 1874 and '75. Since we commenced, also, the manufacture of the Hawkins boiler and vertical high-speed engine, we have met with very flattering success, and on the former have had all we could do, working till 10 o'clock every night, by the aid of Weston electric lights. On the engines we now have four months' orders ahead, and are working nights till 8½ o'clock. The Engine Works were enlarged last spring, and our Blower Works will be enlarged early in the Spring, and enable us to fill our orders more promptly. All the complaints come from delays in delivery. We are putting in new tools, and will add more men if we can find space to put them. Should we not have an order for five months for any of our specialties, we could find enough to keep us busy till then.

The United States Mineral Wool Company, New York, write us:

We are the sole manufacturers of the material called mineral wool, and are, therefore, familiar with its development. From the fall of 1876, to the 10th of last June, it was made by the writer, at Greenwood, Orange County, N. Y., and sold by Mr. Alex. D. Elbers, 26½ Broadway, N. Y. During this period the sales aggregated three million pounds, and the orders ranged all the way from one hundred pounds up to two hundred and fifteen thousand pounds. There was not a steady demand for mineral wool, as was natural to expect in the case of a new article, but the great merit which it possessed in a variety of applications, soon brought it into important notice and made it evident that a market could be obtained by bringing the properties of the material to the attention of the public.

Extensive tests were made by the New York Steam Co., to determine what non-conductor should be used upon their underground steam pipes, and the result showed that mineral wool was the most economical, and altogether the most desirable insulator that could be obtained. Subsequently, the New York Steam Co. became largely interested in the patents on mineral wool, and went to work at once to provide facilities for making and delivering the stuff on the streets of New York. The works were located at Stanhope, N. J., in conjunction with the furnaces of the Musconetcong Iron Co., and were calculated to make about twenty thousand pounds in twenty-four hours.

The plant was completed in August, and has produced as much as was looked for, although it has not yet been necessary to run the works at night.

We have already increased our monthly deliveries over 30 per cent., they having averaged nearly one hundred and fifty thousand pounds for each of the past four months.

Our prospects are very encouraging for the next few months, because mineral wool has been called for in the specifications of several dwellings and charitable institutions.

Frick & Co. (Steam Engines, Boilers and Saw Mills), Waynesboro, Pa., write us:

Our business for the past year was larger than ever before and we were unable to supply the demand for our machinery. We canceled orders for nearly 100 "Eclipse" engines that we could not build in time. During the early part of the year (1881), we put up entire new works, about a mile from old works, and moved into them during June. Our capacity now is about double what it was in old works. We employed over 400 men during the year, running 13 hours per day, and built and shipped over 500 engines, about 200 saw mills, and a large number of stationary boilers, separators, and other machinery. We sold quite a number of our new "Eclipse" Traction Engines (patented), during the year, and all are giving excellent satisfaction. They are built on entirely new principles, with a view to strength, economy, durability and ease of management.

Our prospects for this year are all we could desire, and we expect to build 800 to 1000 engines, several hundred separators and saw mills, and will employ about 600 men.

Wm. Sellers & Co. (Machine and Railway Shop equipments), Philadelphia, Pa., write us:

Our business has been good during the past year and bids fair to continue to be during the present.

The Davidson Steam Pump Company, 41 to 47 Keap street, Brooklyn, N. Y., write us:

The year 1881 has been a prosperous one with us, our business having more than doubled during the season. We have recently put in twelve new lathes, two large boring mills of Philadelphia make, a radial drill from the Niles Tool Works, as well as other tools, and have more ordered. We have orders in some lines that will require six months to fill, but in the mean time we have arranged our facilities so as to accept orders in other lines on reasonably short time. We are shipping this month the four large compound pumping engines for the Mississippi River Commission, and are building twelve pumps for the new Pacific Mail steamers. We have experienced considerable difficulty in getting machinery, but are now better fixed to fill orders than ever before. We have every reason for anticipating all the business we can attend to during the coming year.

COAL is the name of a new weekly journal just started by the publishers of the *Engineering and Mining Journal*, 27 Park Place, New York. It gives thorough and reliable reviews of the coal markets from special information gathered at different points of the country, and a variety of coal trade notes, interesting to every one mining, shipping or dealing in "black diamonds," besides short, pithy articles relating to this industry.

The publishers have not made the mistake of assuming that readers estimate the value of a periodical in proportion to the number of square yards of printed surface it contains, and accordingly they have sent out a small, conveniently-handled 8 page paper. Every user of 100 tons of coal per year would do well to send $2 for a subscription to this journal.

Hollow steel shafting is being introduced into France. It is made by casting the metal around a core of lime, the ingot being finally rolled into shafting, the lime core going with it and diminishing in diameter in the same proportion as the metal, even when the total diameter is reduced as low as one-fourth of an inch.

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☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, JANUARY 28, 1882.

CONTENTS.

	PAGE.
High Speed Automatic Rolling Mill Engine	1
Characteristics of Wrought and Cast Metals	2
Learning and Following a Trade	2
New Compound Pumping Engine	3
Boring for the Pole	3
Rapid Pneumatic Transit	4
Screw Cutting Engine Lathe	4
New Year Promises	4
How to Set and Start a Steam Pump	4
Making Hay Rope Loam Cores. By Thos. D. West	4
Salt as a Lubricant	5
Letters From Practical Men—Steam Engine Economy—Single and Double Cutting Tools—Overhead Direct-Connected Engines—Setting the Valve of an Engine—Computing the Power of Engines—Sizes and Taper of Keys	5, 6
New Steam Reverse for Locomotives	6
Condition and Prospects of the Machinery Business	7
How to Secure Good Mechanics	8
The Advancement of Machine Industries	8
Machine Work the Result of Brain Work	8
Questions and Answers	9
Manufactures	9
Machinists' and Engineers' Supplies	10
Iron and Metal Review	10

The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

How to Secure Good Mechanics.

The most anxious problem machine-shop proprietors have to meet is still that of obtaining skilled workmen. That problem is ever before the shop manager and, as has been the case for some months past, presses at times with unpleasant force. When shops were supplied with only a moderate amount of work, it was comparatively easy to secure a sufficient number of good workmen from other establishments by offering extra good wages, but this method does not at the present time produce as good results as formerly. Establishments having skilled workmen are not likely to part with them to save paying a few cents a day advance in wages. The fact is there are not thorough mechanics enough to go round. Technical schools cannot be depended upon to supply the demand. In the dim future State governments may be persuaded to do something for technical education, but a shop owner would as soon think of waiting for the millennium as for a supply of competent artisans from government institutions. Some of the leading machinery establishments are solving the problem, as far as they are concerned individually by taking apprentices and educating them to the particular kind of work required. As will be noticed in one of the letters from machinery manufacturers in our last issue, the expression occurred—"We shall increase our machinery the coming year and shall adopt a system of taking apprentices, as we find the best way to get good men is to educate them ourselves." This experience is shared by so many others in the same line, that it is leading to the same action in many shops where a different policy has heretofore been the rule. There are plenty of bright, ambitious boys ready to seize the chance to learn the machinist trade, and in the long run it is the most profitable enterprise for a shop to train up its own workmen. Where a definite written agreement is made with apprentices a sufficient number may be induced to stay to complete their three years (or more) of probation, coming out as desirable workmen to retain in the shop. And in most cases, if well treated and paid a reasonable price, they can be induced to *stay* after the term of apprenticeship has expired.

The Advancement of Machine Industries.

Naturally, because it is susceptible of clearer demonstration, the noticeable feature of the progress of machine industries during the past few years is that of *Quantity*. In this direction, it must be admitted, the progress is entirely gratifying. Shops that have increased their productions, during the past two or three years, fifty to one hundred per cent. are the rule, while those that have not largely increased their business—if there are any such—are the exceptions. New enterprises in the direction of machine manufacture have been and are being inaugurated, not as yet at least, to crowd others out, but to help in a measure to supply the apparently never satisfied demand.

However gratifying this may be—and it is certainly something the whole country is interested in, and not alone the comparatively few who are directly engaged in such enterprises—the actual extent of this progress is only in part represented by the dollar and cent. value of the output. Certainly, not less than this in importance is the character of the products in reference to quality. The quantity may have more to do with the present, but the quality has more to do with future prospects.

In this respect, while it may not be possible to measure the advance in quality by figures, we believe, as a matter of fact, that it is quite as noticeable as that of quantity, and that in its permanent effect on business, it is even of much greater importance.

In almost every department of machine industry, notwithstanding that for the last two years manufacturers have been pushed to their utmost to fill orders, an unusual amount of energy has been expended in revising and improving the quality of the products. This is noticeable, because it is more natural under circumstances of unexampled demand, to drift along in old routes than to adopt new courses. The policy of continued improvement in advance of a positive demand is undoubtedly a far-sighted one, since there is no such thing as a standard of excellence in a machine shop. Those who think they are standing still are really going backwards, not only relatively, but absolutely. The reputation of a shop for first-class work means, not that their work is and is to be the same in quality henceforth, but that better work is being done to-day than was done yesterday, and that to-morrow there will be a further advance. In other words, it means progress.

The representative machine shops of the country, judging from observations of the constantly increasing excellence of their products, were never so fully impressed with this fact as at the present time. This argues well for continued prosperity, because so long as the present temper of buyers continues, there will be a demand for improved machines and machinery. Buyers don't expect this year, to buy on the same order, what they bought last year; nor do they expect to use antiquated appliances to their disadvantage.

The old-time theory that a machine tool, or a steam engine, or any thing in the machinery line, is to be put in with a life lease of the room it occupies, is practically exploded. There is not at the present time any especial veneration for ancient industrial appliances. These appliances are coming to be looked at as assemblages of iron and steel, which are bought to do duty till something materially better for the purpose is brought out, and are to be then relegated to the scrap heap, or sold to some unfortunate preserver and user of relics—the small class that form an exception to the general rule.

The part the machine shop is to play in the industries of the future, is fast being remodeled; and instead of constructing machinery to be worn out, and stand in the line of fossilized remains, its mission will be to fashion material for present use, which shall be displaced next year by something that better serves the purpose, and represents progress.

It is not then altogether, nor mainly, the increase in business that warrants continued prosperity, but rather the fact that along with this increase has come an era of progress, that will make the use of still further productions—representing further progress—imperative. This is after all the true basis of machine shop prosperity, and really the important feature of recent advancement.

Machine Work the Result of Brain Work.

Perhaps the average consumer of the various articles manufactured by the aid of automatic machinery has no distinct conception of the amount of brain work involved in designing, building, and successfully operating machines, which to the casual observer seem almost endowed with human intelligence. As a matter of fact, the consumers may know that in the manufacture of pins a machine is employed, which taking the wire from the coil performs all the operations of heading, cutting off and pointing, as the unerring feed rolls carry forward the material, and that after this a machine is used which sticks the pin upon the papers in rows at the rate of 1600 pins per minute. They may know that machines are used for producing machine screws, which, with no outside assistance, transform an entire bar or rod of iron, steel, or other material into screws ready for use, to accomplish which there must be a feed, carrying forward the required length of material at the proper time, a gripping device to close the jaws of a revolving chuck, following which in regular order are the successive motions required to turn the head to an exact size, the body, and the part to be threaded differing in size, and each calling for an operation, after which the screw is threaded, and on being cut off is carried by fingers of steel to another part of the machine, where a revolving saw completes the process by performing the operation of nicking. In the manufacture of a great variety of goods from sheet metal, or wire, which, but a few years since involved many successive operations of feeding by hand, to be operated upon by foot presses, we now see automatic machines which, taking the metal from the sheet, or the wire from the coil, in some cases both sheet metal and wire, for work combining the two, and in place of five or six noisy, clattering foot presses, each operated by an adult, one machine attended by a mere child is performing the operations of all, more rapidly, and producing superior goods. To accomplish these wonderful results, there have been in many cases years of the most exhausting mental exertion, coupled with costly experiments, while to some inventors there seems to have been granted the faculty of seeing the end from the beginning. Let us look at a machine in which there are several succeeding operations, and consider how close must be the calculation of the designer who is capable of arranging all the detail of worm and gear, cams, screws, levers and springs to such a nicety as to be able to fix the shape and dimensions of each upon paper, even to an arbitrary, unadjustable position for each piece, in a combination involving an unerring performance at the exact instant of time, to never interfere one with another, of the successive operations of feeding, cutting off, or cutting out, forming, bending, heading, pointing, piercing, turning, nicking, and threading, with others equally difficult. Many are the sleepless hours of the night passed by those who arrange in imagination the position of cams and other governing parts of automatic machinery, only to find on attempting by day to fix on paper the results of their study, that what looked so simple and easy of accomplishment "will not work." Thus, for months or years, the inventor continues working out his problems on paper, or in metal, or wood, as his taste or acquirements as a draughtsman or mechanic dictate, but, however the results are attained, they must be forced by brain work of the hardest, most exhausting character. Do we, in our admiration of the intelligent action of the various working parts of automatic machinery, sufficiently consider that the admiration is due to the designer, and the mechanic who has the skill to build and successfully operate it? "An intelligent mechanic," is the way the editor of a city paper starts off to comment upon the election of a machinist to the State legislature. Is not the evidence of intelligence on the part of the mechanic so constantly before us in the thousands of articles of necessity, convenience or luxury, which are produced by his wonderful machinery, that a word may be said now and then in his favor in a general way?

Manufacturers of machinery and tools, will do us a favor by mailing us (as soon as published) their new catalogues and circulars. Their favors in this direction will be reciprocated.

We are glad to see a disposition in the present Congress to recognize the claims of a mechanical engineer, who has probably done more for mechanical progress, *for the benefit of the whole people of this country* than any other man now living. When some well-known statesman secures by his efforts the enactment of an important law, he is at once applauded by fifty millions of people, but when an individual not in public life achieves a result in mechanism, of the highest importance and public value, and transfers that result to the Government in the shape of a finished machine, involving almost a life time of study and labor, he has to wait years for suitable recognition. It is, however, a credit to the mechanical genius of this nation, that the Senate Committee on Claims has favorably reported a bill for the relief of Albert H. Emery, the designer and builder (for the U. S. Government) of the greatest testing machine for iron, metals and wood ever constructed. The late President Hayes, in a communication to the House of Representatives said:

"In designing, perfecting, and making this machine, the contractor has expended large

sums of money over and above the contract price, besides giving years of labor for which he has received no compensation,"

The bill which provides for the payment of $225,000 to Mr. Emery should be passed, and thereby justice done. The machine is now in use, and its benefits in making correct tests of material will be incalculable.

Engineers' Society Meetings.

The Annual meeting of the American Institute of Mining Engineers will be held in Washington, D.C., beginning Tuesday, Feb. 21st. The Secretary, Thomas M. Drown, Easton, Pa., requests that members who intend to read papers at this meeting will give him early notice of the same.

The President of the American Society of Mechanical Engineers, Prof. R. H. Thurston, has issued the following circular:

A regular meeting of this Society will be held at Philadelphia, commencing on the second Wednesday in April (April 13), 1882. The Secretary's programme, giving place of meeting and general arrangements will be issued about the first of April, should the Committees have then completed their work and reported.

Chairmen of the Standing Committees will take this general call as a notice to convene their committees for transaction of business coming before them by reference from the Council or otherwise.

The Local Committee, having charge of all details of preparation for the meeting, will be appointed by the Committee on Regular Meetings, and may be consulted by the Committee on rooms and Conversaziones and by members who may be able in any way to assist in making the meeting interesting and profitable.

Members residing in or near Philadelphia are especially urged to co-operate with the Local Committee in every way in which either they or the Committee may find practicable.

The names of the Local Committee will be given when appointed, and members may at any time prior to their appointment correspond with the Secretary in reference to details.

Members are requested to send their papers to the Secretary in ample time for reference to the Committee on Publication.

The reading of papers will be preceded by debate upon papers presented during the year 1881, copies of which are in the hands of all members, and all are requested to examine those papers carefully with a view to taking part in the debate if able to add to the facts there recorded.

The Council is expected to determine at this meeting the place and date of the second regular (Summer) meeting of 1882, and suggestions from members will be gladly received.

Members having friends who wish to join this Society before the Philadelphia meeting will see that their applications are made in time to pass the Council and to be voted upon by the members of the Society in advance of that session. The last meeting of the council to receive applications will take place at least twenty days before the meeting of the Society.

A council meeting will be called for general business one hour before the opening of the general session. A full attendance is important.

Opinions of Our Technical Exchanges.

The rapid growth and permanent success of the AMERICAN MACHINIST, is one of the most remarkable features of the later history of technical journalism. The paper is, indeed, a product of genuine ability and untiring enterprise, and hence deserving of the highest measure of success. *Railway Review.*

AN ABLE, INDEPENDENT JOURNAL.

The AMERICAN MACHINIST, has just begun its fifth volume. Its success has been remarkable and especially gratifying, as it is another demonstration that independence and honesty in editorial statements, backed by good business ability in its management, is appreciated by American mechanics and those interested in manufacturing machinery. By avoiding the insertion of paid puffs, its conductors have shown wisdom and discretion in not underrating the inteligence of their readers. The able and timely treatment of the subjects that come within its province has secured for it a reputation of being one of the best authorities in its line. *The Sanitary Engineer.*

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

If "Poor Apprentice," who writes us in reference to a university course, will give us his address, we will endeavor to give him the information he asks for.

(29) G. A., Brooklyn, N. Y., asks: Will you please tell me how a license as marine engineer is obtained? *A.* By applying to the Inspector's office in the Post Office building in New York, and passing the regular examination.

(30) W. H. P., Avondale, N. J., asks: What should be the size of steam pipe in order to get hard work from a pair of hoisting engines with 7″ cylinders? *A.* Main pipe 2½″, and branch pipes to cylinders 2″ diameter.

(31) W. C. S., Lynn, Mass., writes: I have a boat 24 feet long, 4 feet 3″ beam, and 32″ draught. Engine is 4″x6″, and I intend to carry 125 pounds steam. What diameter and pitch ought the propeller to be, and what speed can I get? *A.* Diameter of propeller, 30″; pitch, 38″ speed 6 to 7 miles an hour.

(32) M. E. K., Dansville, N. Y., asks: Will you please tell me through your paper if an inch pipe is stronger than the same sized solid iron rod? *A.* No, it is not so strong. If you were to take an 1¼″ bar of iron and drill an inch hole through its length, it would not be as strong as the solid bar; and, for similar reasons, the pipe is not so strong as the bar.

(33) D. O. H., Sheridan, Ill., asks: 1. Will you please tell me how to rig up something to get an indicator card from my engine, without an indicator? *A.* There is no way to get an indicator card from an engine except by the use of an indicator. 2. How may I understand the card when I have it; what part of the card shows the work of the different parts of the engine, and how may I get the power of my engine? *A.* If you get an indicator you should get an instruction book with the instrument, and from this learn the use of it.

(34) W. B., Erie City, Pa., asks if there is any machinery that will effectually pulverize raw bones as fine as flour, and without leaving any small splinters? *A.* We have no knowledge of any such machinery in use. You probably might accomplish your purpose by the aid of some of the mills in use for other purposes, but, in the absence of reliable data, it would be, to a great extent, a matter of experiment to arrange for pulverizing so finely as you wish.

(35) G. V. W., Mendota, Ill., writes that he has three boilers connected together, and has trouble in keeping the water level in them. The feed pipe from pump runs across the ends of the boilers, and branch pipes connect this pipe with each boiler. In each of the three connecting pipes is a globe valve, and nearer the pump a single check valve. He thinks that by branching off from the feed pipe in such a way as to give each of the three boilers an equal chance to get its supply of water from the feed pipe, retaining the globe valves for regulating the supply, and putting in a check valve near each boiler, the water would always remain at the same height in each boiler, and asks, Is this so? *A.* No; nothing can take the place of careful attention to the water level in all the boilers. You are correct, however, in your plan of placing a check near each boiler. This you should do by all means. If you do not put a cock between each check and boiler, you should keep the check in the main feed pipe, as otherwise the sticking up of one of the checks may heat the pump. Altogether the plan you propose is much superior to the one you are using, and will give you much less trouble.

BUSINESS SPECIALS.

50 cts. a line for each insertion under this head.

James W. See, Consulting Engineer, Hamilton, O.

Presses and Dies. Ayar Mach. Works, Salem, N. J.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

Alfred Wilkinson, Expert Tests of Steam Engines and Boilers, 123 N. 4th St., Phila.

List of Machinists in U. S. and Canada; just compiled. Price $10. A. C. Farley & Co., Philadelphia.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Fuel saved; payment proportional to saving. R. Grimshaw, 430 Walnut Street, Philadelphia.

Metallic Letters and Figures, to put on foundry patterns; all sizes. H.W. Knight, Seneca Falls, N.Y.

Mechanical drawings, machine designs, tracings and Patent Office work. A. J. Emery, Mechanical Engineer and Draughtsman, 58 Liberty Street, N.Y.

"How to Keep Boilers Clean," and other useful information for steam users and engineers. Sent free by the publisher, Jas. F. Hotchkiss, 84 John Street, N. Y.

Russell & Struthers, Wax Process for making outline engravings. Specimens each week in the AMERICAN MACHINIST. We also do Map Engraving with best facilities. Russell & Struthers, 59 Park Place, New York.

"Slide Valve Gears," by Hugo Bilgram, published by Claxton & Co., Phila., describes the easiest method known for correctly proportioning slide valves, link-motions and cut-off gears; Price, $1.00.

"Patent Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. We can furnish Volume 3 of the AMERICAN MACHINIST, containing the full 52 issues of 1880, neatly bound in cloth, ready to ship by express, for four dollars. Unbound, three dollars. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton Street, New York.

"Useful Information for Steam Users." A 100 page *Illustrated Pamphlet.* Contains interesting data on the care and management of the steam engine and boiler, and rules for engineers and firemen. The engineers of every well regulated establishment should have this work. Sent by mail on receipt of twenty-five cents in postage stamps. The J. N. Mills Publishing Co., 165 Broadway, New York.

"Extracts from Chordal's Letters," the most interesting mechanical book published. Just the thing for a Holiday gift. A great variety of mechanical and business topics treated in a wise and witty way that will be instructive to old and young mechanics, and interesting to everybody. As many as 150 copies have been sold in a single shop. Over 40 Humorous illustrations; 330 pages, 12 mo. Price, $1.50 per copy, by mail, to any address. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton St., New York.

The publishers of the Engineering and Mining Journal will issue January 4, 1882, and each Wednesday thereafter, COAL, a weekly journal, to be devoted exclusively to the interests of the coal trade, including: 1. The mining and preparation of coal for market. 2. Its transportation. 3. The marketing of coal. 4. The economical use of coal. COAL will be profusely illustrated, and the freight, labor and wages questions will be treated in a thorough and popular manner. The statistical information of COAL will be collected with great labor and care, and will give the current production of coal throughout the country. COAL will be conducted by gentlemen of ability and great experience in every department of the coal trade, and will have, at the outset, a large staff of reliable correspondents at the different coal centers of the country. Subscription price, $2 per year. Specimen copies on application. Address The Scientific Publishing Company, 27 Park Place, New York. P. O. Box 1833.

Ealy's "Blue Book"—Credits of the machinery, hardware, implement and metal trades. Published semi-annually by the National Hardware and Stove Association, 51 Chambers Street, New York, and 79 Dearborn street, Chicago; John W. Ealy, General Manager. This book contains information regarding the capital and pay ratings of over 60,000 dealers and manufacturers, together with a classified list of all manufacturers, wholesale and retail dealers in hardware, iron, machinery, agricultural implements; railway, machinists', engineers' and boiler makers' supplies, brass goods, plumbers, and dealers in plumber's supplies; stoves, tin, cutlery, guns, and the users of iron and metals generally. This reference list has heretofore been confined exclusively to the hardware and metal trades; the machinery trades have been recently added to the long-established features already existing. Furnishing detailed written reports to subscribers of the condition and paying qualities of any dealer is an important feature of the system. Published January and July. Price, $75 for two books, written reports, etc. Address John W. Ealy, General Manager, 51 Chambers Street, New York.

MANUFACTURES.

The Zylonite Company, Adams, Mass., have commenced the construction of a machine shop.

Todd, Hull & Co. are building a large flour mill at Fergus Falls, Minn.

Sweetser & Merritt, Brockton, Mass., have commenced the manufacture of a new upright drilling machine.

Pullman's Palace Car Co. have nearly completed repair shops, 180x250 feet, at St. Louis. The bulk of their repairs will be done at that point.

The Johnston Ruffler Co., Ottumwa, Ia., manufacturers of sewing machine attachments, are full of work, and enlarging their facilities.

Messrs. Clark & Atkins, of Cleveland, Ohio, are talking of establishing a cotton tie and hoop iron mill at Chattanooga, Tenn.

The rail mill of the Philadelphia and Reading Railroad Company, Reading, Pa., is manufacturing steel rails from imported stock.

The Star Paper Company, Shortsville, N. Y., expect to rebuild at once the Star Mill recently destroyed by fire.

The St. Louis Iron and Machine Works, St. Louis, Mo., have a large order for machinery to be used on Mississippi River improvements.

The St. Louis Hot-Pressed Nut and Bolt Company have the order for the iron work for the reconstruction of the St. Charles bridge.

The South St. Louis Foundry, recently destroyed by fire, has been rebuilt, with large additions to both foundry and machine shop.

J. C. Wilson & Co., millers, who were recently burned out, are building a new mill at New Castle, Pa.

The Northwestern Horse Nail Company has purchased five acres of land at Brighton, Ill., and will at once erect works.

The Babcock and Wilcox Company, New York, are to furnish a 1,500-horse power boiler for the Belcher Sugar Refining Company, of St. Louis, Mo.

The Helmbacher Forge and Rolling Company, St. Louis, Mo., are about adding new machinery for welding railroad coupling links.

Henry McPherson has fitted up an office at 111 Fulton Street, Brooklyn, N. Y., where he will make drawings, tracings, etc., for the machinery trade.

The new cupola at the Wason Car Works, Chattanooga, will have a capacity of one hundred car wheels per day. About three cars per day are now being manufactured at the works.

The Franklin Foundry and Machine Company, Providence, R. I., are filling an order for cotton machinery from the Bella Vista Cotton Mills at Tepic, Mexico.

Capitalists of Charleston, S. C., Atlanta, Ga., and Nashville, Tenn., have subscribed $150,000 for the establishment of a fertilizing manufactory at Nashville.

E. Hodge & Co., builders of marine boilers, Boston, Mass., have recently improved their shops by putting in a new engine, boilers and electric lights.

The Manchester Locomotive Works, Manchester, N. H., are working 625 men, and running thirteen hours, with work enough booked to last well into the Summer.

The Whitin Machine Co., Whitinsville, Mass., employ 90 moulders, notwithstanding which they have just placed an order for 100 tons of castings with outside parties.

S. Hosmer, Lynn, Mass., who makes machine and special forgings, is busy on extensive orders from the Ashcroft Manufacturing Company, of Boston, Mass.

The Elgin Tubular Iron Company, Elgin, Ill., have a contract to furnish the city of Fon du Lac with four towers for the electric lighting of the city.

J. W. Bocage & Co., Pine Bluffs, Ark., have brought out and perfected an oscillating engine, for which they are pressed with orders beyond their capacity.

The Chicago Steel Horse Shoe Company, has recently added four more Pratt & Whitney hammers to their works at Pullman, Ill. This company has increased its capital stock to $150,000.

The Standard Coal and Iron Company of Columbus, Ohio, capital $50,000,000, proposing to control most of the furnaces and mines in Hocking Valley, held its first election in Boston this week, and will begin operations soon.

The city government of Portland, Me., has offered such inducements to the Maine Central Railroad Co., as, it is believed, will induce them to locate extensive shops there. The inducements consist in offering land at a low figure, and a nominal valuation for taxation for ten years.

The firm of Witherow & Gordon, Pittsburgh and New Castle, Pa., have two iron establishments, and are turning out a superior quality of work. Their New Castle establishment is pushed to its utmost capacity. Several first-class men can obtain situations there.—*National Labor Tribune.*

Robert Grimshaw, Jno. W. Nystrom, W. Barnet Le Van, and others, are working together as a board of engineering experts, at 430 Walnut Street, Philadelphia, under Mr. Grimshaw's direction. They offer to take contracts to improve boilers and engines, save fuel, etc., taking as pay a proportion of the saving effected.

The Dayton Screw Co., of Dayton, Ohio, has been incorporated. Capital, $250,000. Albert G. Angell, late of the American Screw Co., will have full charge of the business. With his energy, and an experience of nearly forty years in the business, it is safe to predict a success. They propose starting with a plant for producing 10,000 gross per day.

J. H. Kerrick, who has long been in the machinery business at Indianapolis, Ind., has moved to Minneapolis, Minn., to conduct the same kind of business. In noticing the change the Indianapolis *Journal* says: "Mr. K. has been engaged in the machinery business here for years, and has the reputation of being a first-class business man. He has a great many acquaintances all over the State, and, in fact, all through the West."

Manager Williams, formerly of the Keystone Mills, Pittsburgh, has a very ingenious contrivance, which he intends to test when the rolls of Brown, Bonnell & Co.'s new mill at Youngstown are started. It consists of a screw to be placed under the rolls; which will catch the cinder from the iron as it passes through the rolls. The screw revolving will carry the cinder to the end of the rolls and dump it into a pit, whence it can be easily removed. Hitherto the cinder has fallen under the rolls and piled up, having to be removed by shovels.

A new hoop machine at Concord, shown at Ford & Co.'s foundry, consists of two revolving cutters, four inches in diameter, with a revolving gauge. The pole from which the hoop is cut is drawn rapidly through the machine, and the hoop is of uniform thickness, requiring no planing or shaving, but is ready for use at once. Three hoops are cut from most of the poles, and in some cases four hoops. During five minutes' time 20 hoops were made by this machine, which measured 160 feet in length. It is claimed that a man can make at least 3,000 hoops a day with it, which is an immense saving, as 300 made in the ordinary way are regarded as a day's work.—*Boston Commercial Bulletin.*

The Western Brass Works are doubling their capacity by the introduction of new machinery, and the extension of operating room. They have leased the premises adjoining, formerly occupied by the Excelsior Plating Works. They have recently bought a 25-horse power engine, and are putting in the best machinery that money will buy; besides, they are having some special tools made to order. This is one of the youngest of St. Louis' manufacturing enterprises, but active work and merit in production have given them an enviable reputation. They will soon have over forty machines and tools in operation, trying to keep even with orders which they have been behind on for a year.—*The Age of Steel.*

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 12, 1882.

The supply market continues active and orders though small are very numerous.

The prices of Coe's Wrenches, which have been advanced, depend upon size of orders and style of goods.

The manufacturers of forged cast steel goods such as sledges, hammers, railroad mauls, etc., have advanced their prices to 40 per cent. discount.

The Wausau Iron Works, Wausau, Wis., have just issued a new illustrated catalogue and price list of 42 pages, describing Improved Saw-Mill Machinery of their own manufacture.

Prices of Buffalo Forges have been advanced about 10 per cent.

Iron and Metal Review.

The active demand for Pig Iron continues with an increased inquiry. Prices are gradually advancing as has been generally expected.

We quote foundry No. 1 at $27; Foundry No. 2 X at $25; Gray Forge, $24. Transactions in Foreign Iron during the past week have been light owing to the limited supply in the market, and new arrivals are anxiously looked for. We quote Gartsherrie at $26 to $26.50; Coltness, $27 to $27.50; Glengarnock, $25.50 to $26; Carnbroe, $25.75; Eglinton, $24.50 to $25. Steel, Iron and Old Rails unchanged. Prime Wrought Iron Scrap in demand at $32.50. Merchants' Bar Iron in steady active demand. Present card rate adopted by manufacturers, 2½c. and likely to remain so for a month, at least.

The demand for copper has been rather light during the past week at 20¼c. to 20⅜c. for Lake Superior. Straits and Australian Tin, 24¾c. to 25c. Lead, 5c.; Spelter, Western, 5¾c to 6c. Antimony 14½c. to 15c. for Cookson, and 13c. for American.

WANTED

"Situation and Help" Advertisements, 30 cents a line, each insertion. About seven words make a line. Should be received Thursday morning.

Mechanical Draughtsman desires re-engagement. Address, BOX 2, AMERICAN MACHINIST, Office.

An experienced mechanical draughtsman, with first-class references, is open for engagement. Apply 221 East 52d Street, N. Y.

Wanted—Ten or fifteen first-class vise and lathe hands. None but steady and reliable men need apply. B. W. Payne & Sons, Corning N. Y.

A young Swede, graduated from Technical High School, and with some experience, desires a position as draughtsman. Address Simon, Westboro, Mass., Box 881.

Mechanical draughtsman desires situation in manufacturing establishment. Has experience in erecting heavy machinery. Good references. Address Box 14, AMERICAN MACHINIST.

Wanted—A graduate of an Eastern scientific school wishes a situation as mechanical draughtsman. Has been employed on steam engines and tools. Address Box 9, AMERICAN MACHINIST office.

Wanted—Foreman to take charge of spoke lathes. None but men of experience, that can furnish the best of references as to capacity and sobriety, need apply. Chester & Harris Manufacturing Co., St. Louis, Mo.

Tool maker wanted to work in a tool room in a machine shop. One accustomed to lathe, vise and milling machine work. Good fair pay and steady employment to the right man. Address, with reference, M. C. Bullock, 80 to 88 Market Street, Chicago, Ill.

Wanted—A good, practical superintendent for iron works doing general engine and machine work. To a thorough mechanic, with two or three thousand dollars, an interest will be given. Man preferred who can work up specialties. Reference required. Address Lock Box No. 181, Tremont, Schuylkill Co., Penna.

111 Fulton St., Brooklyn, Room 7.

To Machinists, Engineers and Inventors:

The undersigned begs to announce that he has opened a drawing office at the above address, where he is prepared to make general plans, details and tracings on the lowest terms. Postal will receive prompt attention. HENRY MCPHERSON.

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Practical Iron Moulder.
Written for practical men in both large and small foundries.
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Is the Standard of Excellence
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THE A. S. CAMERON
STEAM PUMP WORKS,
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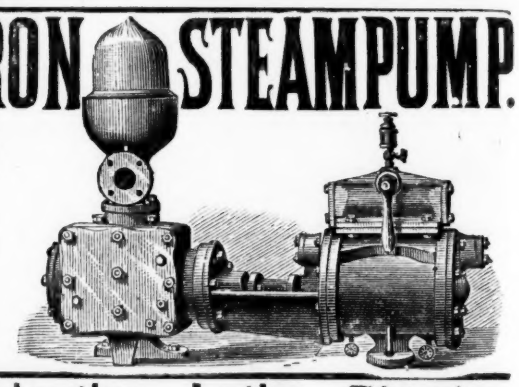

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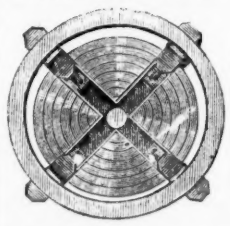

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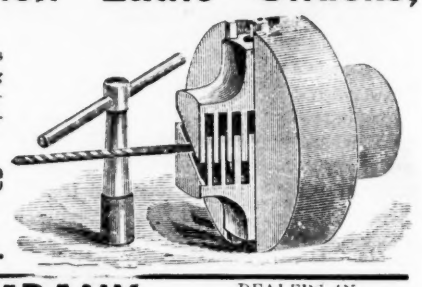

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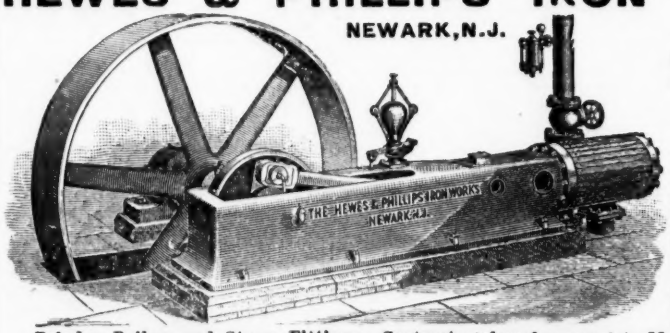

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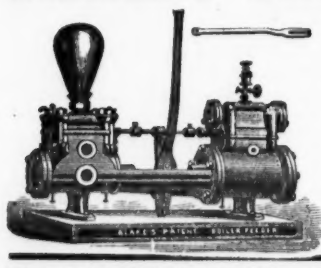

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Merits have been proved during ten to fifteen years constant use by such concerns as Cheney Bros., South Manchester, Conn.; Wallace & Sons, Ansonia, Conn; Wampanoag Mills, Westamoc Mills, Saguamore Mills, Fall River, Mass.; Sears' Building, Boston, Mass; Brown & Sharpe Mfg. Co., Providence, R. I.; A. T. Stewart & Co., Tiffany & Co., New York; Stevens Institute, Hoboken, N. J.; Matthiessen & Wiecher's Sugar Refinery, Jersey City, N. J.; Wm. Sellers & Co., S. S. White, Daniel Allen, Jno. Gardiner & Co., Phosphor Bronze Smelting Co., Henry Bower, Evening Bulletin, Saturday Night, Philadelphia, Pa., and numerous others.
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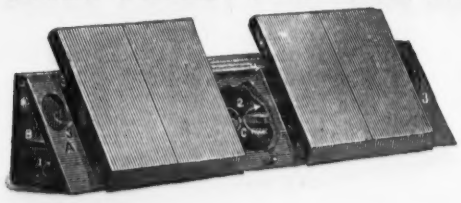

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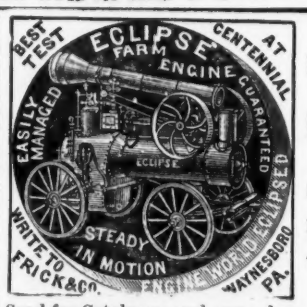

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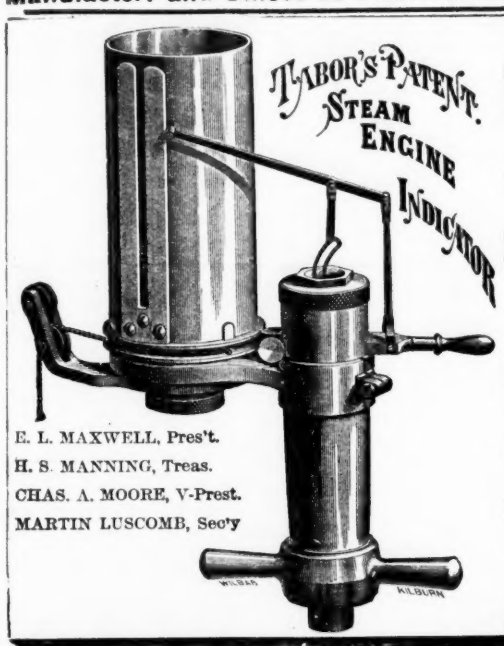

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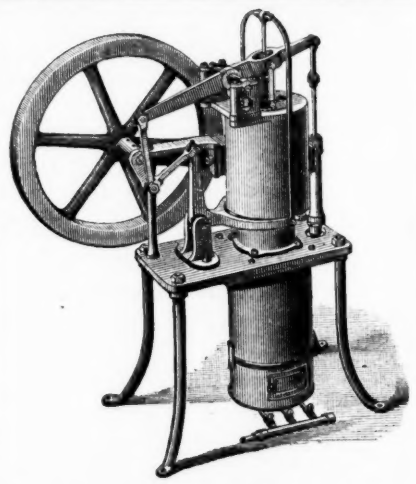

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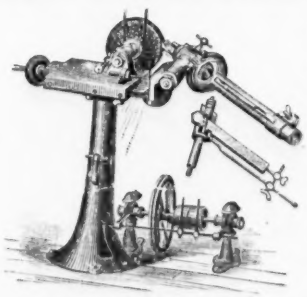

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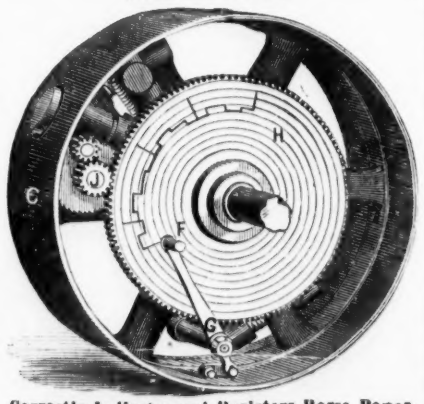

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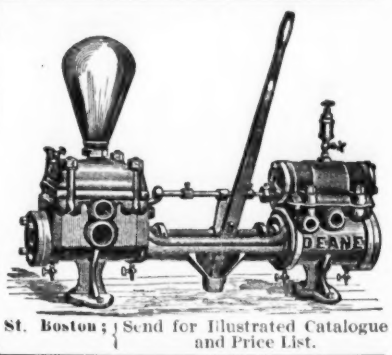

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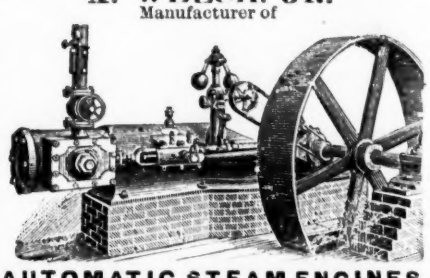

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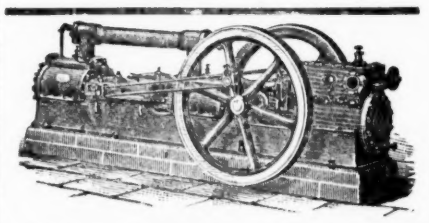

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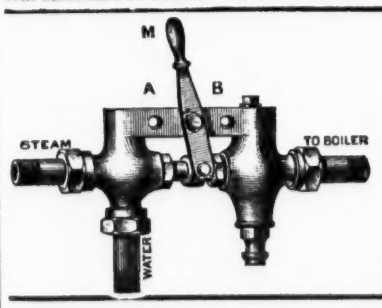

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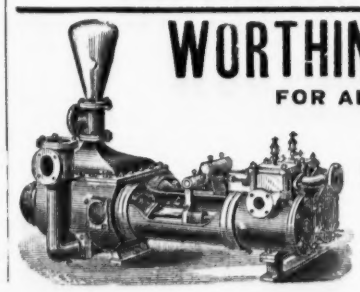

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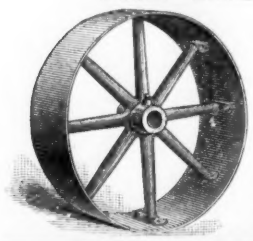

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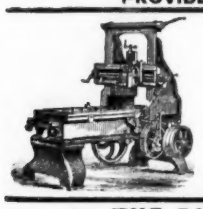

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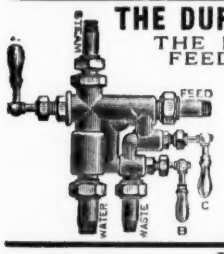

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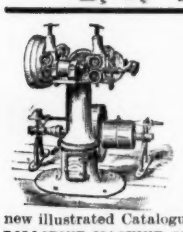

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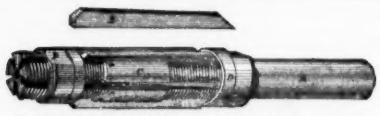

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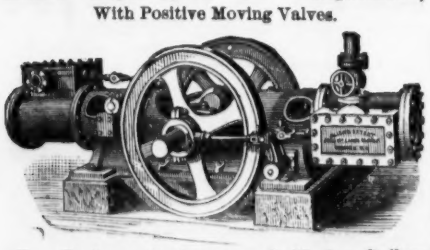

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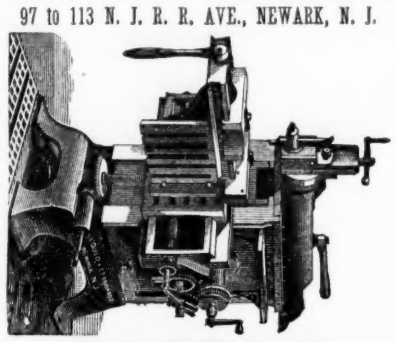

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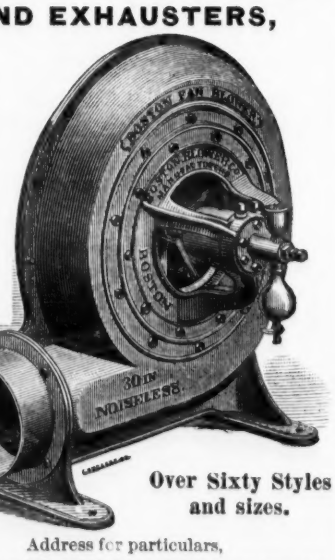

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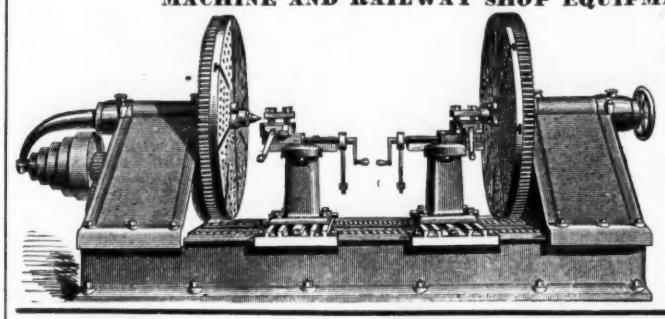

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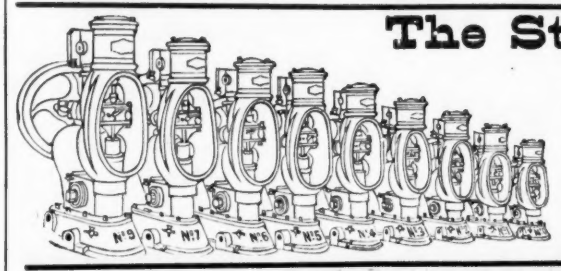

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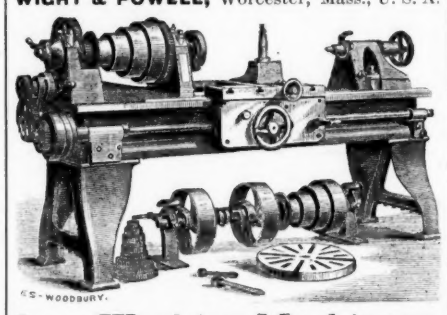

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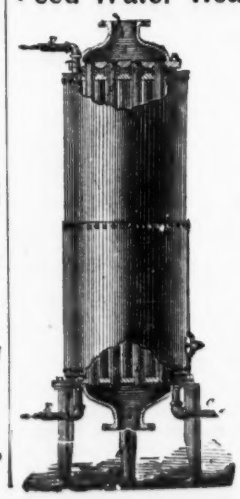

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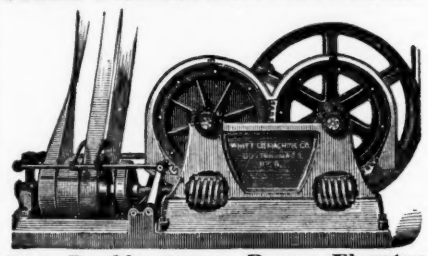

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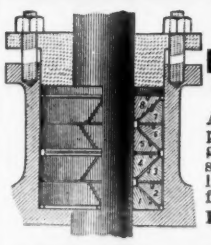

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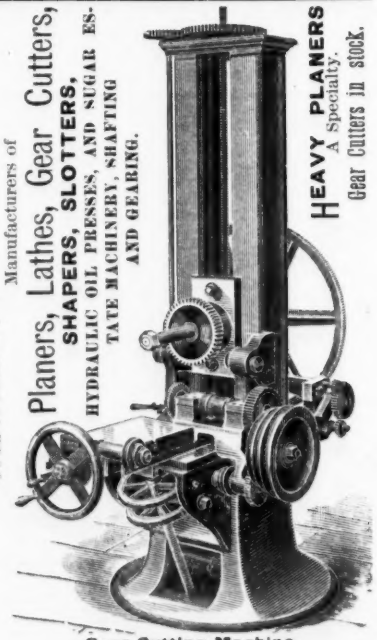

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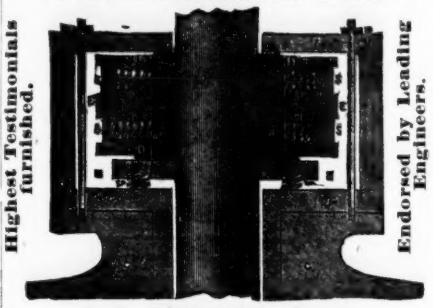

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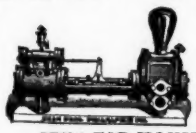

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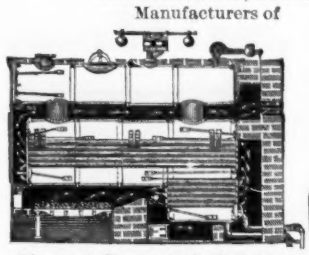

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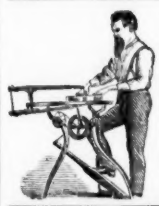

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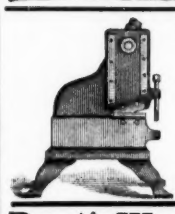

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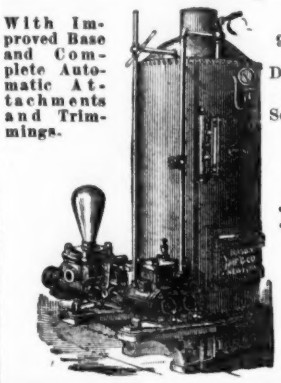

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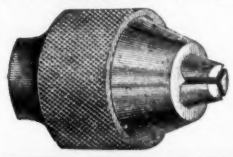

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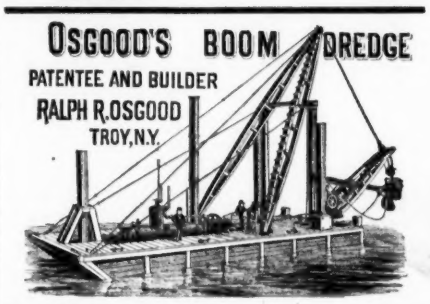

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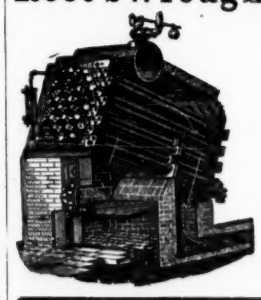

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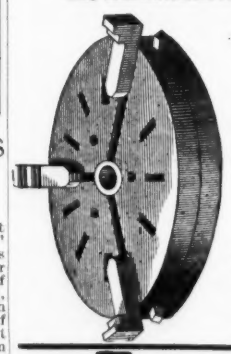

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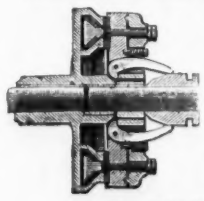

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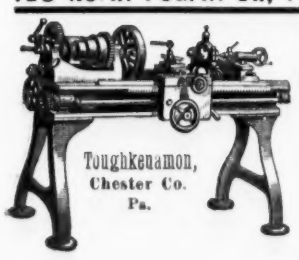

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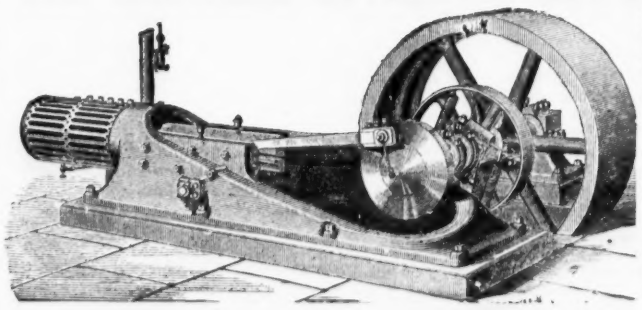

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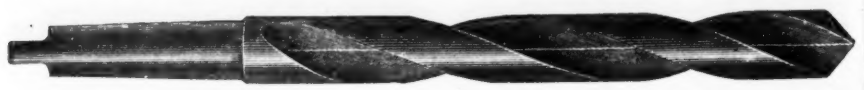

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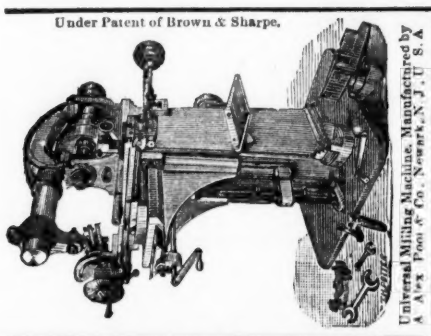

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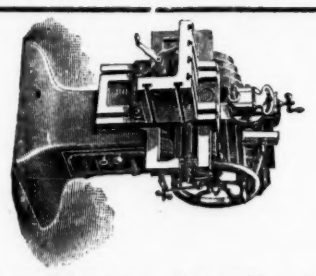

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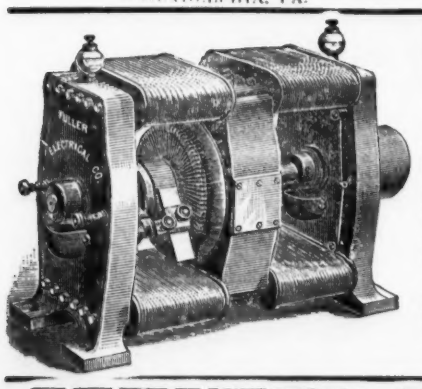

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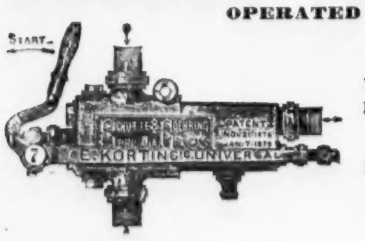

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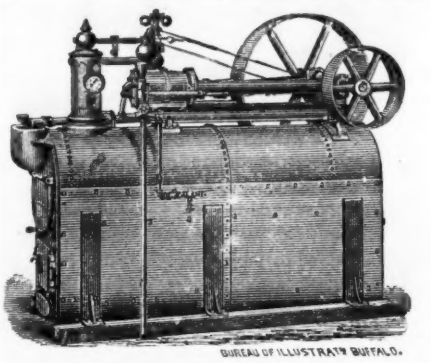

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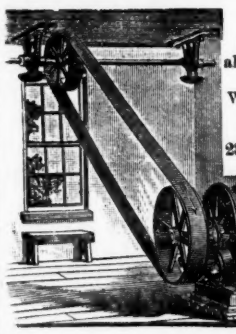

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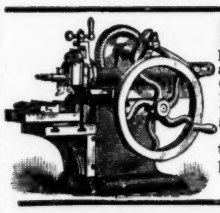

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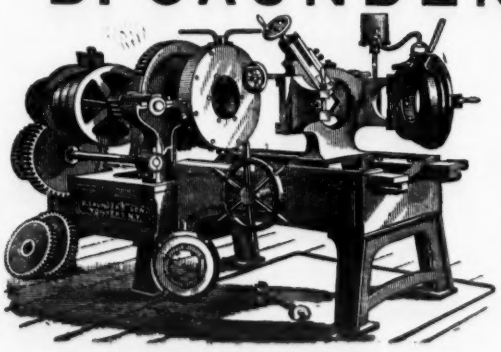

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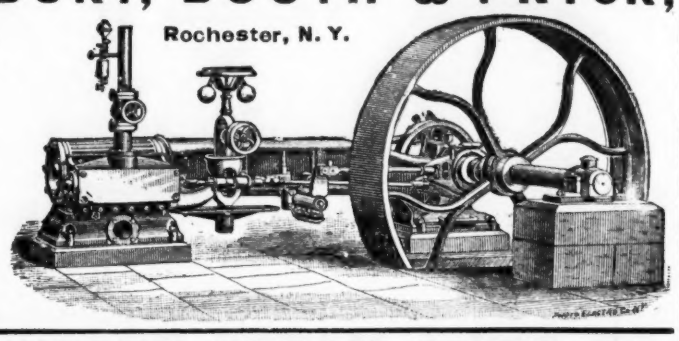

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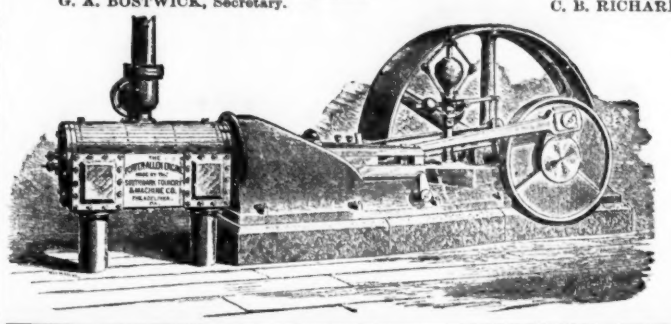

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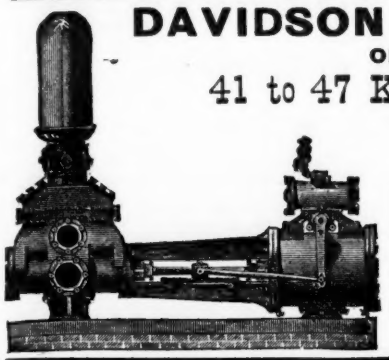
Improved Steam Pump.



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Teeth cut diagonally. Grips Round Iron or Pipe.

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Differs from all others in having a continuous tuyere. Blast enters fuel at all points, causing complete diffusion of air, and uniform temperature throughout the furnace. Melts 10 to 15 tons an hour with blast pressure required to melt 2 or 3 tons in an ordinary cupola. Gains largely in time, fuel and quality of casting.

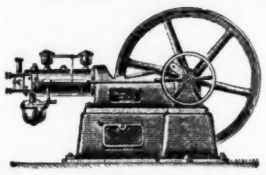
NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.

Started Instantly by a Match, it gives full power immediately.

When Stopped, all Expense Ceases.

No explosions; No Fires nor Cinders; No Gauges; No Pumps; No Engineer or other attendant while running.



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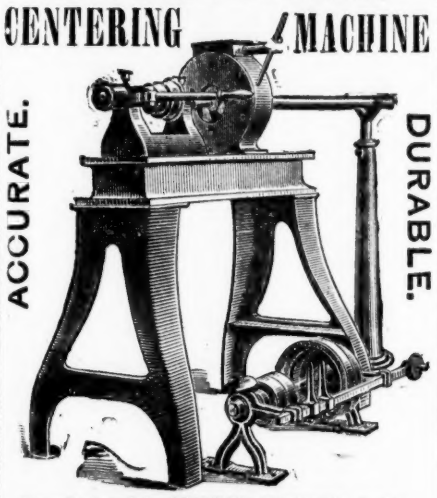

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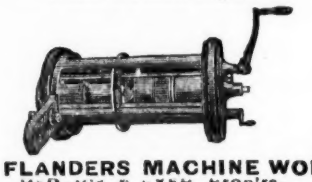
PORTABLE CRANK PIN MACHINE,

for turning off crank pins in position and while wheels are under engine.



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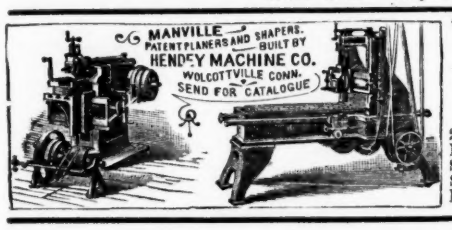

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One Car Axle Lathe. Hewes & Phillips. New.
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One " " 28 in. x 16 ft. Fifield. New.
One " " 28 in. x 12 ft. " "
One " " 24 in. x 12 ft. Ames. New.
One " " 24 in. x 10 ft. New Haven.
One " " 20 in. x 14 ft. Fifield. New.
One " " 20 in. x 10 ft. Pond. A1.
One " " 20 in. x 12 ft. Ames. New.
One " " 20 in. x 10 ft. " "
One " " 20 in. x 8 ft. " New.
One " " 18 in. x 9 ft. White'b. Good order.
One " " 18 in. x 10 ft. Jones & Lamson, New. 1⅛ in. Hole in Spindle.
Three Engine Lathes 18 in. x 8 ft. Jones & Lamson New.
One Engine Lathe, 18 in. x 8 ft. Lathe & Morse. Good order.
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Six Engine Lathes, 16 in. x 6 ft.-7ft. x 8 ft. Ames. New.
One " " 15 in. x 6 ft. Flather's. New.
One " " 15 in. x 6 ft. Jones & Lamson. New.
Three " " 14 in. x 6 ft. Star Tool Co. New.
One " " 14 in. x 6 ft. Hand. New.
One " " 14 in. x 6 ft. Blaisdell. New.
One " " 13 in. x 6 ft. Ames. New.
One " " 13 ft. x 4½ ft.
One " " 12 in. x 6 ft.
Two " " 11 in. x 5 ft.
One Hand Lathe. 11 in. x 4½ ft. New Spencer.
One " " 12 in. x 5 ft. Hendey. New.
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One 15 inch Stroke Shaper. Gould & Eberhardt. New.
One 16 in. Upright Drill. Prentice. New.
Two 20 in. " " Prentiss. New.
One 24 in. " " Ames. New.
One 38 in. " " New Haven. New.
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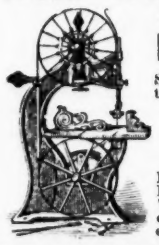

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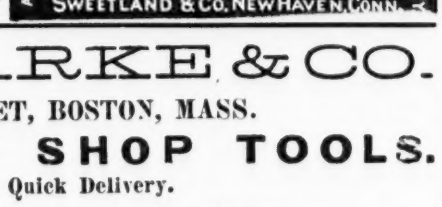

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NEW MACHINE SHOP TOOLS.

List of Sizes for Quick Delivery.

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20 in. swing, 8 ft. bed. Wight & Powell.
20 " " 12 " " " "
20 " " 12 " " Ames.
20 " " 10 " " Flather.
21 " " 10 " " Blaisdell.
21 " " 12 " " "
21 " " 14 " " "
22 " " 16 " " Ames.
24 " " 12 " " "
24 " " 16 " " Blaisdell.
26 " " 16 " " Niles.
30 " " 15 " " Ames.
30 " " 23 " " "
32 " " 26 " " Gleason.

Iron Planers.

22 in. x 20 in. x 4 ft. Wheeler.
24 in. x 24 in. x 6 ft. Hendey.
24 in. x 24 in. x 6 ft. Whitcomb.
26 in. x 24 in. x 6 ft. Gleason.
26 in. x 24 in. x 7 ft. "
24 in. x 24 in. x 8 ft. Ames.
26 in. x 26 in. x 8 ft. Pond.
27 in. x 27 in. x 8 ft. Whitcomb.
28 in. x 28 in. x 6 ft. Gleason.
28 in. x 28 in. x 8 ft. "
30 in. x 30 in. x 8 ft. Whitcomb.
30 in. x 30 in. x 8 ft. Harrington.
36 in. x 36 in. x 12 ft. Gleason.
42 in. x 42 in. x 16 ft. "

Second-Hand and New Machinery.

January 12, 1882.

The following New and Improved Machinist-Tools are part of what we have for early delivery:

2 30 in. swing, 15 ft. bed, Engine Lathes. February.
1 22 in. swing, 13½ ft. Bed Engine Lathes. January.
3 18 in. " 10 ft. " " "
3 18 in. " 8 ft. " " "
2 15 in. " 6 ft. " " "
2 30 in. " Upright Back Geared Drills. February

The following in store:

2 22 in. swing, 12 ft. Bed Engine Lathes. 2d-hand.
1 19 in. " 6 ft. " " "
2 18 in. " 10 ft. " " New.
2 18 in. " 8 ft. " " "
2 16 in. " 6 ft. " " "
2 16 in. " 7 ft. " " "
1 17 in. " 6 ft. " " 2d-hand.
1 17 in. " 7½ ft. " " "
1 15 in. " 5 ft. " " "
1 12 in. " 4 ft. " " "
1 21 in. " 10 ft. Bed Turret Head Lathe.
1 15 in. " 5 ft. Bed Hand Lathe. 2d-hand.
3 12 in. " 6 ft. " " New.
1 10 in. " 4½ ft. " " "
1 Axle Lathe. New.
1 38 in swing Pulley Lathe, new.
1 Round Arbor Fox Lathe.
1 15 in. Hendey Shapers. New.
2 48 in. Swing Radial Drills. New.
1 36 in. Car Wheel Borer. Nearly new.
2 20 in. Upright Drills. Back Gear. New.
1 27 in. Upright Drill. Nearly New.
2 24 in. Harris Upright Drills. Second-hand.
2 Wall Drills, heavy. Second-hand. 60 and 72 in
1 3 Spindle Drill. New.
1 Pratt & Whitney Cam Cutter, 2 heads. Fine.
2 Milling Machines, Lincoln pattern. Second-hand
2 Manhattan Arms Co. Millers. Second-hand.
1 Sellers Milling Machine. 2d-hand.
1 Face Milling Machine. Second-hand.
1 Pond's Double Mill'g Machine. 2d-hand.
1 Garvin " " "
1 No. 2 Screw Machine. New.
1 Screw Head Slotter. Second-hand.
3 Second-hand Profiling Machines.
1 Vertical Centering Machine. Nearly new.
3 4½ in Horizontal Centering Machines. New.
3 Emery Grinders. 2d-hand.
1 Sellers' Tool Grinder. "
1 Pipe Cutting Machine. Second Hand. 2 in.
1 Bolt Cutter, 1½ in. New. With Taps and Dies
1 Bolt Pointing Machine. Second-hand.
1 Double Nut Tapper. New.
3 Pulley Facing Machines. Second-hand.
1 Horizontal Boring Bar, 12¾ in. diam " "
1 " " Machine, Small. 2d-hand.
1 " " " 4 spindle "
1 Betts, No. 2, Power Punch. New.
4 Double Acting Presses, No. 3, nearly new.
4 Single-Acting Presses, for power, "
100 Foot Presses, nearly new.
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2 Small " " Presses. "
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1 Grind Stone and Frame.
1 Crane. Second-hand. 20 ft. jib 6 Tons.
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Cold Rolled Shafting, Pulleys, Hangers, Couplings, &c., always in store.

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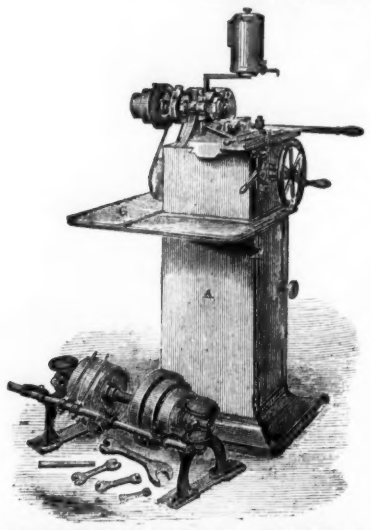

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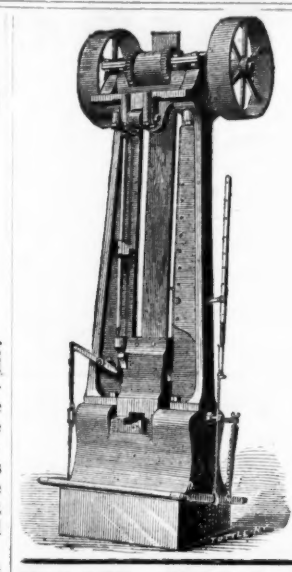
Whole length of table, 20 inches; whole width of table, 7½ inches; distance of feed of table, 9 inches; height of centre above table, lowest point, 1½ inches; height of centre above table, highest point, 3¼ inches; vise jaws, 3½ inches long, ¾ inch deep. Weight, boxed ready for shipment, about 750 lbs. Price, boxed and delivered at Railroad or Steamer in Providence, $260.



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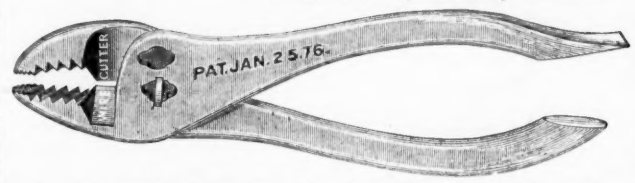

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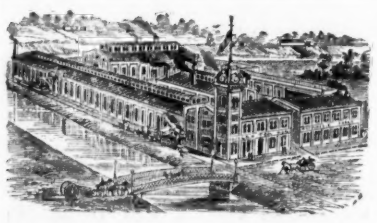

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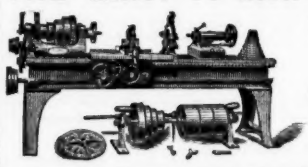

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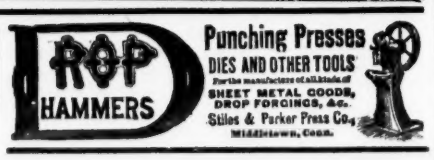

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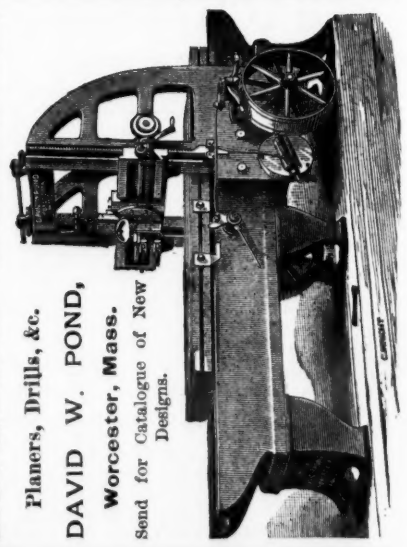

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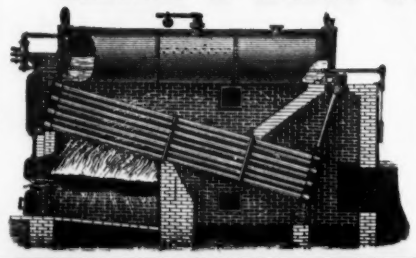

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